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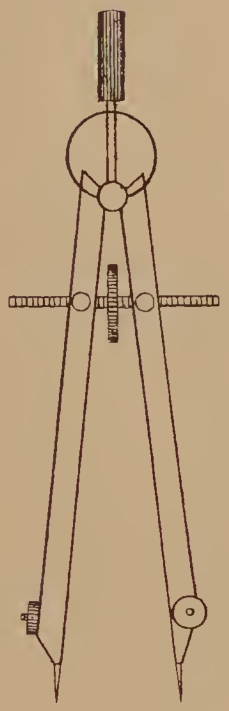
THE ART & SCIENCE OF CARTOGRAPHIC TEXT PLACEMENT

A Practical BLM Guide

Stephen Meszaros



U.S. Department of the Interior
Bureau of Land Management
Arizona State Office

Phoenix, Arizona

2004

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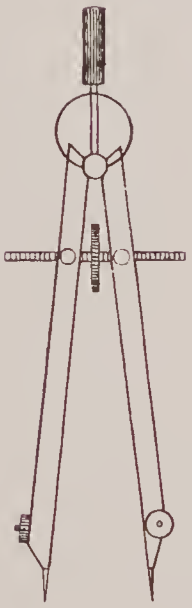

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2004

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ABSTRACT

The correct placement of text on maps is discussed utilizing numerous examples to demonstrate proper cartographic techniques.

AUTHOR'S NOTE

This document is the fourth in a series of guide books designed for the novice map maker. (See the Bibliography for a listing of these guides, as well as other useful books on cartography.) In particular, it builds upon and extends the information presented in the publication *Cartographic Notebook.* The purpose of these documents is to aid those new to map making in their creation of better quality maps.

TABLE OF CONTENTS

Abstract iii
Author's Note v
Introduction 1
The Golden Rule of Cartography 2
Type Styles 3
Type Size 3
The Maps 5
Appendices 97
    Appendix I: Type Sizes 99
    Appendix II: Summary Map Edit 101
    Appendix III: Smoothed Text Examples 105
    Appendix IV: Text Ghosting 111
Bibliography 115
About the Author 117

INTRODUCTION

This publication takes a brief look at the "art and science" of the placement of text on maps. The "science" of text placement refers to the alignment of type so that it is straight, spaced evenly, and (basically) mathematically correct. The "art" of text placement is concerned with positioning the type so that it is easy to read, understandable, and graphically attractive. This document takes a look at both the art and science, but is primarily concerned with the "art" part of the equation.

The proper placement of text on a map is a more exacting procedure than may initially be apparent. Indeed, the text may even be considered as an "alien feature" of the map (in the sense that the mapped mountains, rivers, and cities exist in reality "on the ground," but the text does not). However, no understanding of the map is possible without it. The lines, symbols, colors, etc. of the map have no meaning without the text to explain them. This problem was perhaps best expressed by one of the most eminent cartographers of the 20th century:

> The application of lettering is one of the most difficult problems in cartography. The essential of the problem derives from the fact that lettering is not a part of the map according to our definition, for it is not visible on a conventionalized picture of the Earth; but it is a necessary addition to identify features. The names by their bulk cover up many of the important elements of the real landscape and prevent the reader from seeing the map as a picture of the Earth. On small-scale maps city names often cover hundreds of miles in length, even if printed in the smallest readable type, and their least disturbing placement is a trial to cartographers. The development of expressive cartography has been hindered more by lettering than by any other cause.*

In order to properly place text upon a map, judgment, balance, and graphic experience are required. This document will use actual examples to demonstrate both problems and suggested solutions in the use of text. Taken as a whole, of course, the entire map (text included) must subscribe to "The Golden Rule of Cartography" if it is to be successful. Consequently, we will start by defining and then explaining this "Golden Rule" on the next page, before concentrating on text questions in the rest of the document.

---

* The statement was by Erwin Raisz in *General Cartography* (1938) as quoted by another distinguished cartographer of the 20th century Arthur H. Robinson in his book *The Look of Maps: An Examination of Cartographic Design* (1966).

THE GOLDEN RULE OF CARTOGRAPHY

"A Map must be Readable, Understandable, and Accurate"

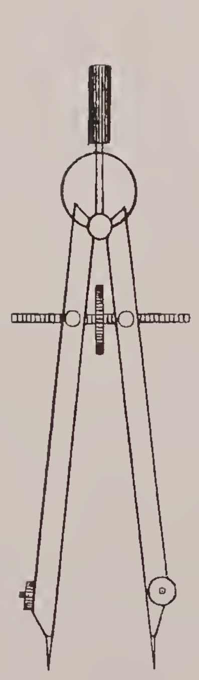
First, the map must be readable. The text should be large enough to see, the line weights bold enough to be visible, and the design not so complex or cluttered that it is, in fact, unreadable. Second, the map must be understandable. It should be designed *for* the educational and experience level of the target audience, so that they will be able to understand it. Finally, the map must be accurate. All data presented upon it has to be correct and as current as possible. These three items constitute *The Golden Rule of Cartography*. Their proper utilization will result in a successful map.

TYPE STYLES

Literally hundreds of type styles are available for graphical use, depending upon the purpose of the visual. In mapping – because readability and understanding are paramount – very simple and easily visible typefaces should be selected. Ornate and hard to read fonts such as Old English or Chaucer should be avoided (these are only for special purpose graphics). Sans serif typefaces such as Helios, Helvetica, and Univers are especially excellent choices for their clean, clear design. They take reduction in size very well and may be modified to bold, condensed, or extended versions, as needed. There are also some good serif typefaces available that are easily readable, such as Times Roman and Century Schoolbook. In practice, both serif and sans serif type styles may be used on a map, to help in differentiating various cartographic features.

TYPE SIZE

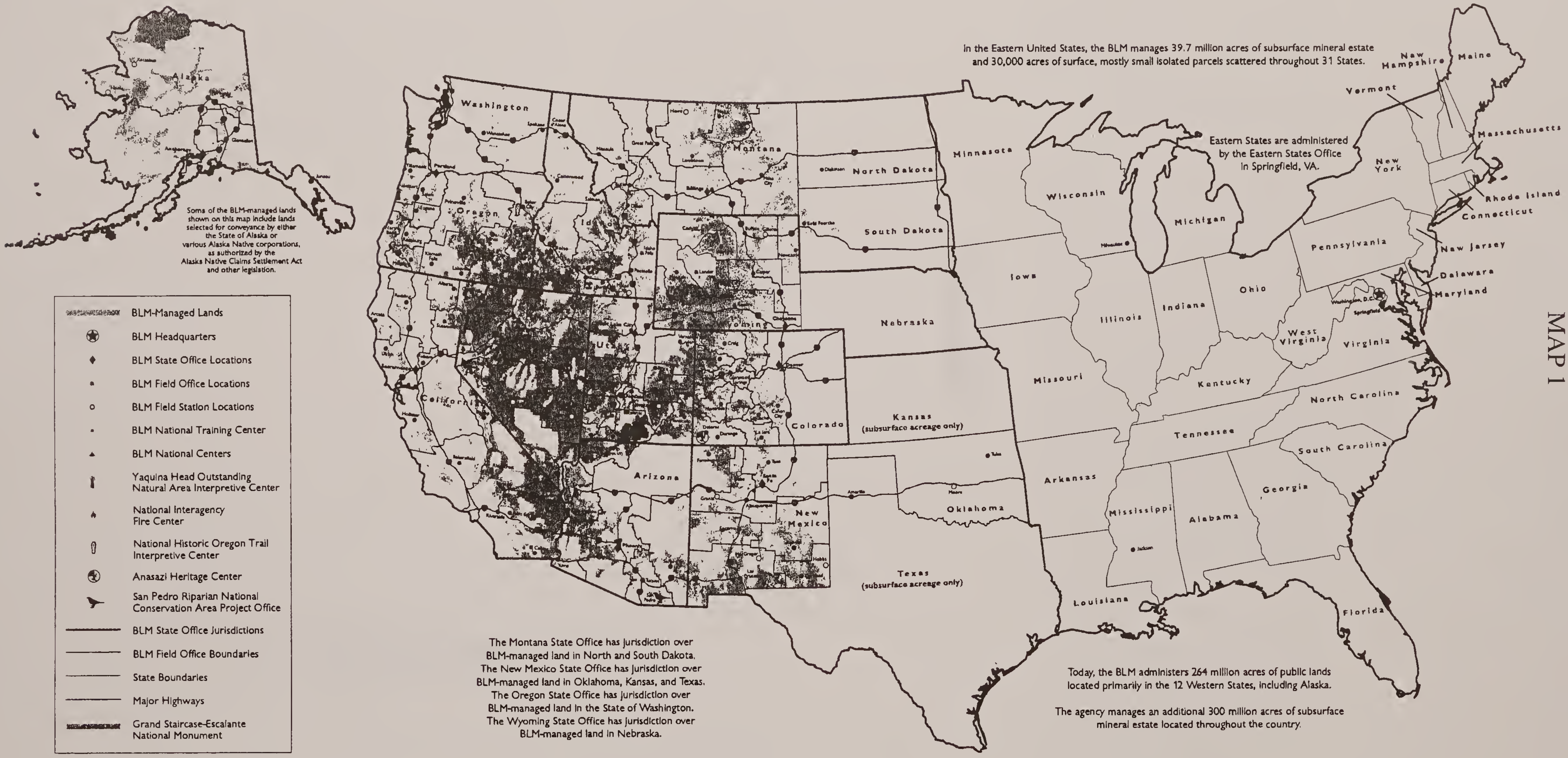
The size of type used on a map is one of the most important factors in achieving map readability. In particular, if the type is too small it will be hard to read or – if the map is reduced – not readable at all. I recommend using a size no smaller than 6 point. (Actually, if the 6 point text is in both upper and lower case, that means the lower case letters are not much larger than upper case *4 point type!*) In practice it is much better to select 7 point or even 8 point as the minimum text size on a map – assuming that the map will not be reduced from this size. See Appendix I for a "Type Sizes" guide for mapping and other uses.



THE MAPS

MAP 1

Public Lands Managed by the Bureau of Land Management (BLM)


Alaska
BLM-Managed Lands
BLM Headquarters
BLM State Office Locations
BLM Field Office Locations
BLM Field Station Locations
BLM National Training Center
BLM National Centers
Yaquina Head Outstanding Natural Area Interpretive Center
National Interagency Fire Center
National Historic Oregon Trail Interpretive Center
Anasazi Heritage Center
San Pedro Riparian National Conservation Area Project Office
BLM State Office Jurisdictions
BLM Field Office Boundaries
State Boundaries
Major Highways
Grand Staircase-Escalante National Monument
Washington
Oregon
Idaho
Montana
North Dakota
South Dakota
Wyoming
Nebraska
California
Nevada
Utah
Colorado
Arizona
New Mexico
Kansas (subsurface acreage only)
Oklahoma
Texas (subsurface acreage only)
Minnesota
Wisconsin
Michigan
Iowa
Illinois
Indiana
Ohio
Missouri
Kentucky
West Virginia
Virginia
Pennsylvania
New York
Vermont
New Hampshire
Maine
Massachusetts
Rhode Island
Connecticut
New Jersey
Delaware
Maryland
Washington, D.C.
Springfield
North Carolina
South Carolina
Tennessee
Arkansas
Mississippi
Alabama
Georgia
Louisiana
Florida

Some of the BLM-managed lands shown on this map include lands selected for conveyance by either the State of Alaska or various Alaska Native corporations, as authorized by the Alaska Native Claims Settlement Act and other legislation.

In the Eastern United States, the BLM manages 39.7 million acres of subsurface mineral estate and 30,000 acres of surface, mostly small isolated parcels scattered throughout 31 States.

Eastern States are administered by the Eastern States Office in Springfield, VA.

The Montana State Office has jurisdiction over BLM-managed land in North and South Dakota. The New Mexico State Office has jurisdiction over BLM-managed land in Oklahoma, Kansas, and Texas. The Oregon State Office has jurisdiction over BLM-managed land in the State of Washington. The Wyoming State Office has jurisdiction over BLM-managed land in Nebraska.

Today, the BLM administers 264 million acres of public lands located primarily in the 12 Western States, including Alaska.

The agency manages an additional 300 million acres of subsurface mineral estate located throughout the country.

MAP 1

This is a map that was designed to be used in an 8.5" X 11" document. It is shown at its publication size. Note that most of the text in the western part of the United States – where the main interest of the map is located – is too small to be read. Also the "BLM – Managed Lands" tone tends to obscure the text underneath it (although on the original color map this was not quite so objectionable).

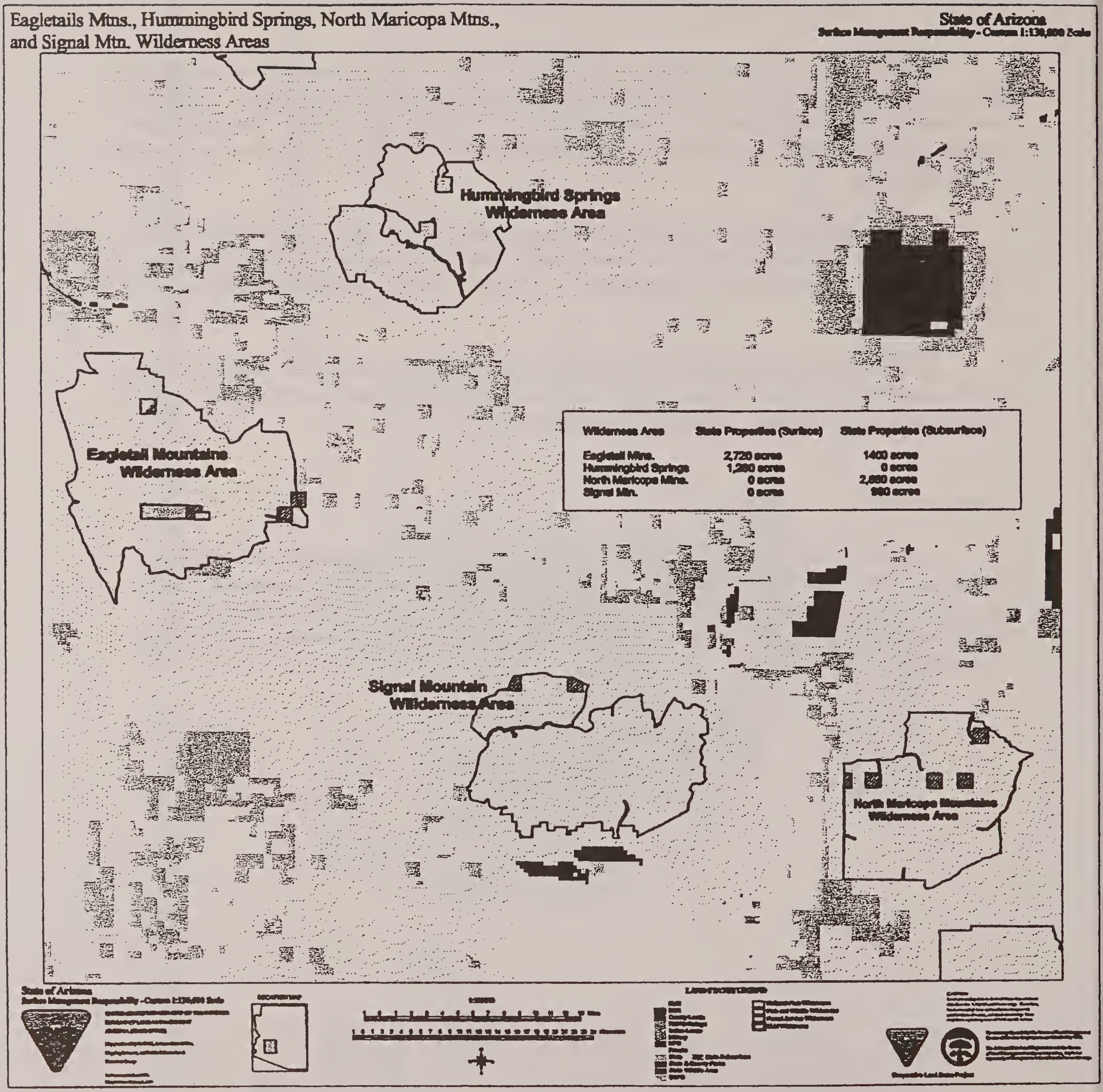
The map should have been simplified to show only the most important national features, with a minimum 6 point type size. This could easily have been done as all the western states are shown later in the document at full page size. That is the place for the detailed information to be included.

An alternative possibility to the original map would have been to show just the western U.S. in a vertical ("portrait") format. The image would have been larger and thus more detailed information could have been included, at a readable size.

Other concerns:

A simple scale bar should have been included so that the reader could have at least a general idea of distances on the map. Of course two scale bars are actually needed as Alaska is not at the same scale as the coterminous United States, as shown here. This would aid any confusion the reader might have, concerning the true size relationship between Alaska and the "lower 48."

MAP 2


Eagletails Mtns., Hummingbird Springs, North Maricopa Mtns., and Signal Mtn. Wilderness Areas
State of Arizona
Surface Management Responsibility - Custom 1:130,000 Scale
Hummingbird Springs Wilderness Area
Eagletail Mountains Wilderness Area
Signal Mountain Wilderness Area
North Maricopa Mountains Wilderness Area
State of Arizona
Surface Management Responsibility - Custom 1:130,000 Scale

Wilderness Area	State Properties (Surface)	State Properties (Subsurface)
Eagletail Mtns.	2,720 acres	1400 acres
Hummingbird Springs	1,280 acres	0 acres
North Maricopa Mtns.	0 acres	2,880 acres
Signal Mtn.	0 acres	960 acres

MAP 2

This is an example of a map that was reduced in size way beyond its capabilities to be read and understood. The original map was designed as a large "wall-sized" chart for display but was then reduced to page-size for a special project. Note that the text has become so small that very little can be easily read on the map itself, while the legend is essentially illegible. Even the legend boxes and scale are undecipherable.

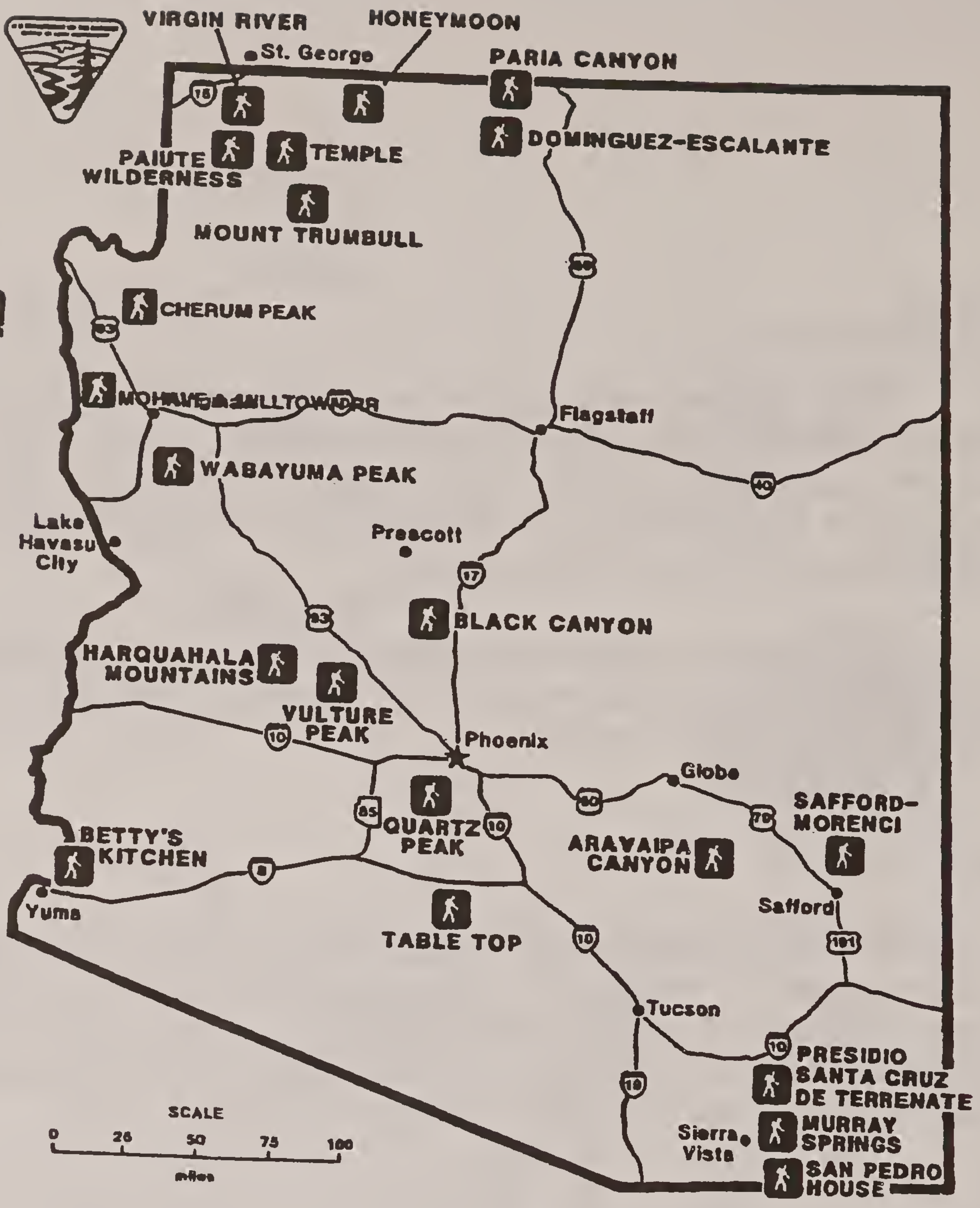
The elements of a map – and especially the text – must be designed specifically for the final map size. If a map is to be reproduced at a smaller size, this must be taken into account when the original map is created.

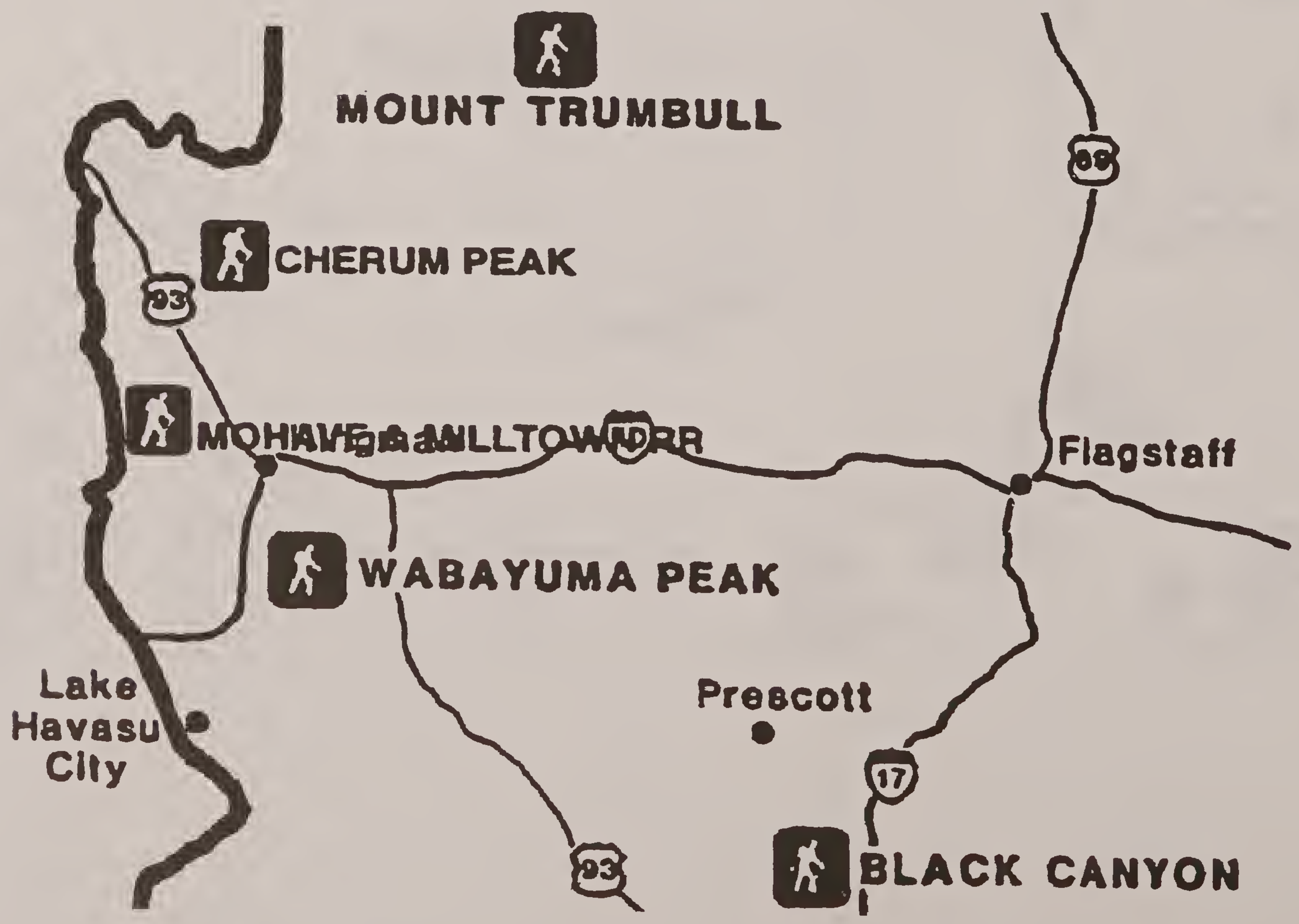
Other concerns:

Note that the map states (in the upper right corner) that it is at the 1:130,000 scale. This was the scale *at the original size.* Now that the map has been reduced, that figure is completely wrong. This is why I recommend that, if there is *any* chance that a map will be changed in size, the proportional scale (1:130,000 in this case) not be used. If you employ a bar scale it will change in size *with* the map, thus it will always be correct.

MAP 3

Arizona BLM Trails


VIRGIN RIVER
St. George
HONEYMOON
PARIA CANYON
15
PAIUTE WILDERNESS
TEMPLE
DOMINGUEZ-ESCALANTE
MOUNT TRUMBULL
89
CHERUM PEAK
93
MOHAVE & MILLTOWN RR
Kingman
40
Flagstaff
WABAYUMA PEAK
40
Lake Havasu City
Prescott
17
93
BLACK CANYON
HARQUAHALA MOUNTAINS
VULTURE PEAK
10
Phoenix
Globe
60
70
SAFFORD-MORENCI
85
QUARTZ PEAK
10
ARAVAIPA CANYON
BETTY'S KITCHEN
8
Yuma
Safford
TABLE TOP
10
191
Tucson
10
PRESIDIO SANTA CRUZ DE TERRENATE
19
Sierra Vista
MURRAY SPRINGS
SAN PEDRO HOUSE
SCALE
0
25
50
75
100
miles


MOUNT TRUMBULL
89
CHERUM PEAK
93
MOHAVE & MILLTOWN RR
Kingman
40
Flagstaff
WABAYUMA PEAK
Lake Havasu City
Prescott
17
93
BLACK CANYON

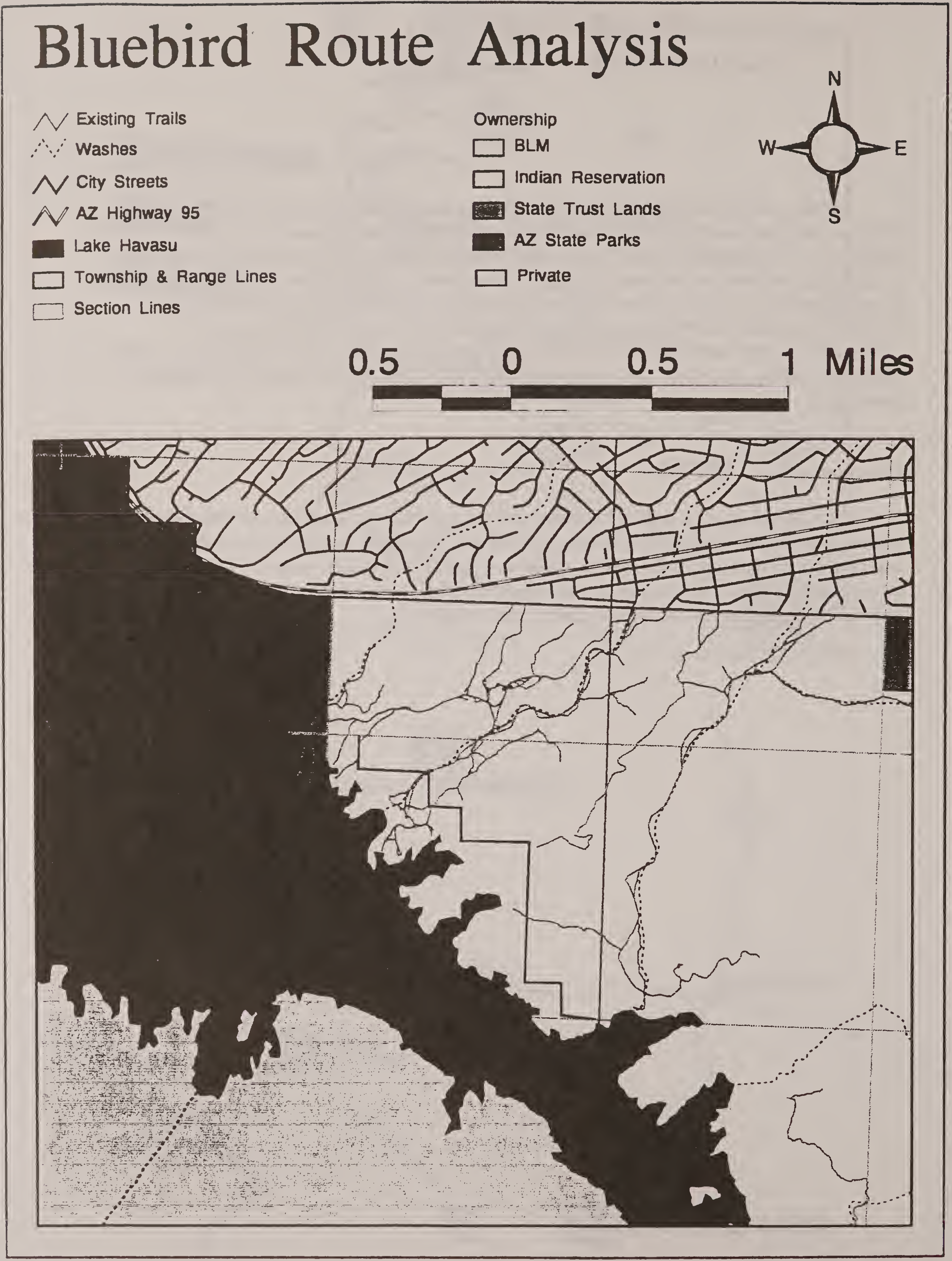
MAP 3

When placing text on a map it should be obvious that the overlaying of text on top of other text must be avoided. Yet it is surprising how often this happens and – even more surprising – that it goes unnoticed. This map is a classic example of the problem. It was used as a single page informative handout. The upper map shows the original size while the lower part is an enlargement of the area of interest. Note that the text (and this is very hard to read) for "MOHAVE & MILLTOWN RR" has been positioned right *on top* of both the text for "Kingman" and the "Interstate 40" road designation shield. Obviously this map was not properly edited. Avoiding overlaying (and thus unreadable) text is a basic requirement of professional cartography.

Other concerns:

If you look closely, you will note that the text and hiking symbols for "CHERUM PEAK" and the (unreadable) "MOHAVE & MILLTOWN RR" are slightly different from the other text and symbols on the map. Although the variation is subtle, it is indeed present. When doing changes and/or additions to any map, care should be taken to insure that exactly the same type and symbol styles (and sizes) are used for similar modifications.

MAP 4


Bluebird Route Analysis
Existing Trails
Washes
City Streets
AZ Highway 95
Lake Havasu
Township & Range Lines
Section Lines
Ownership
BLM
Indian Reservation
State Trust Lands
AZ State Parks
Private
N
W
E
S
0.5
0
0.5
1 Miles

MAP 4

The size of text on a map indicates its importance. Larger text "demands attention" while smaller text sizes carry with them the implication of less significance. Consequently, it is desirable to structure text size on a basis of "hierarchy." What is most important on the map should have the larger (and perhaps also bolder) text. Smaller text sizes indicate less significant items.

This map demonstrates a poor choice of text hierarchy. The title is the largest type on the page, which is correct. The title should always be the most prominent in size. However, the scale bar and its associated text are way too large. By having it so huge the reader would think that the *scale* is what the map is all about; that is certainly not the case. Always plan your text sizes on the basis of importance, concerning what is really the purpose of the map.

Other concerns:

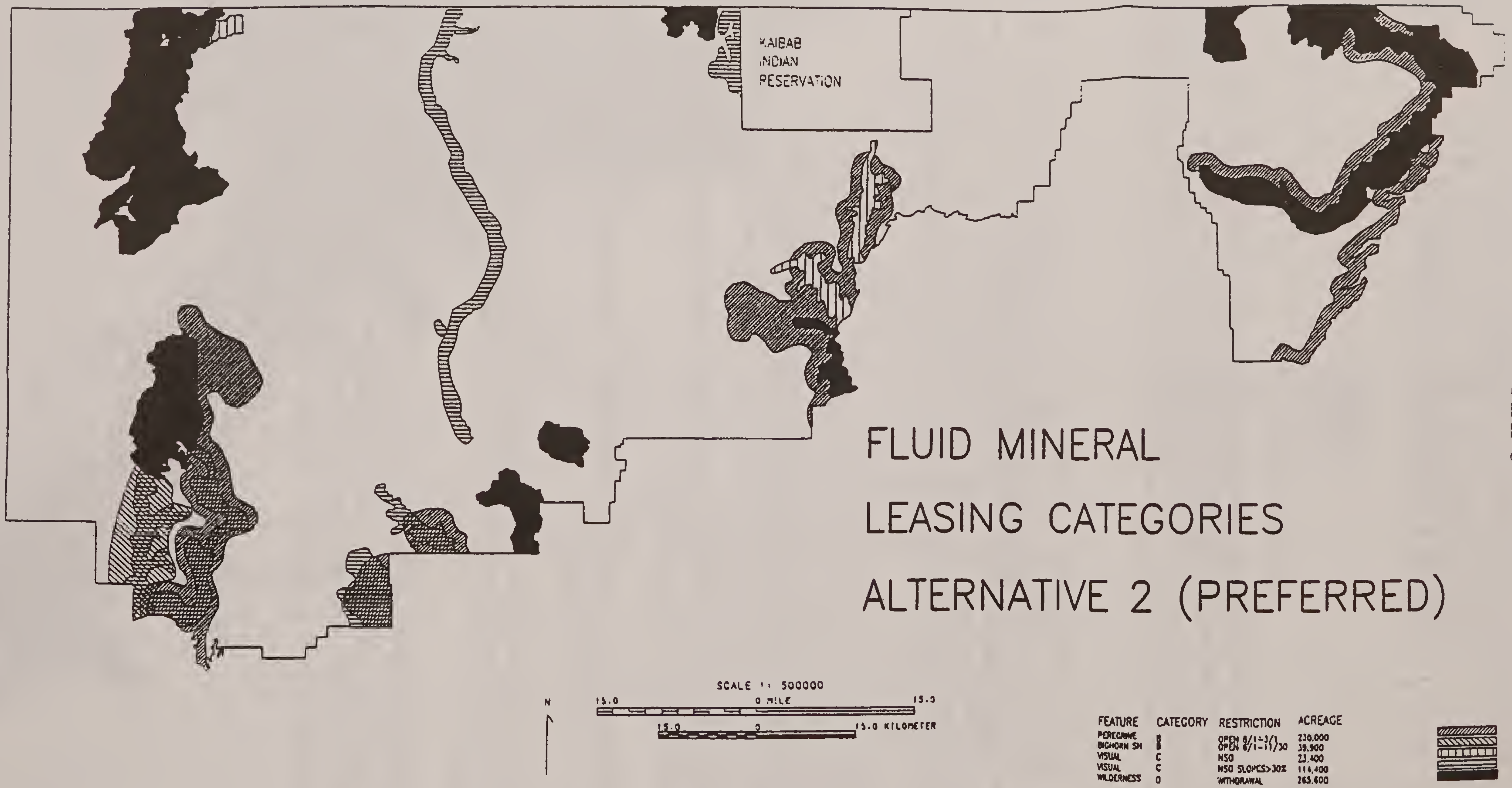
The zigzag lines used for trails, washes, streets, and Highway 95 should be *straight* lines in the legend.

The township & range lines and section lines should be *lines* not boxes in the legend (they are *linear* features, not *area* features).

Positioning of the boxes in the legend is poor. They should be accurately aligned and spaced, both vertically and horizontally.

The term "Ownership" should be replaced with "Land Status." (Ownership implies that the land *belongs* to the government, rather than being *managed* by the government for the benefit of its citizens.)

"Parallelism" should probably be observed in the legend. That is, all similar items should be either singular or plural. In this case, it could be either "BLM Managed Land, Indian Reservation, State Trust Land, AZ State Park Land." Or it could be "BLM Managed Lands, Indian Reservations, State Trust Lands, AZ State Parks."



FLUID MINERAL LEASING CATEGORIES ALTERNATIVE 2 (PREFERRED)

KAIBAB
INDIAN
RESERVATION
SCALE 1: 500000
N
15.0
0 MILE
15.0
15.0
0
15.0 KILOMETER
FEATURE CATEGORY RESTRICTION ACREAGE
PEREGRINE B OPEN 8/1-3/1 230,000
BIGHORN SH B OPEN 8/1-11/30 39,900
VISUAL C NSO 23,400
VISUAL C NSO SLOPES>30% 114,400
WILDERNESS 0 WITHDRAWAL 265,600

MAP 5

Text size on a map should follow a smooth hierarchy of sizes, flowing from the most important item – the title – down to units of lesser importance (but, in any case, no smaller than 6 point type). This map displays an odd choice of text sizes from very large to very small, *with nothing in between!* For a visually more attractive and informative product, a gradational series of sizes should have been used.

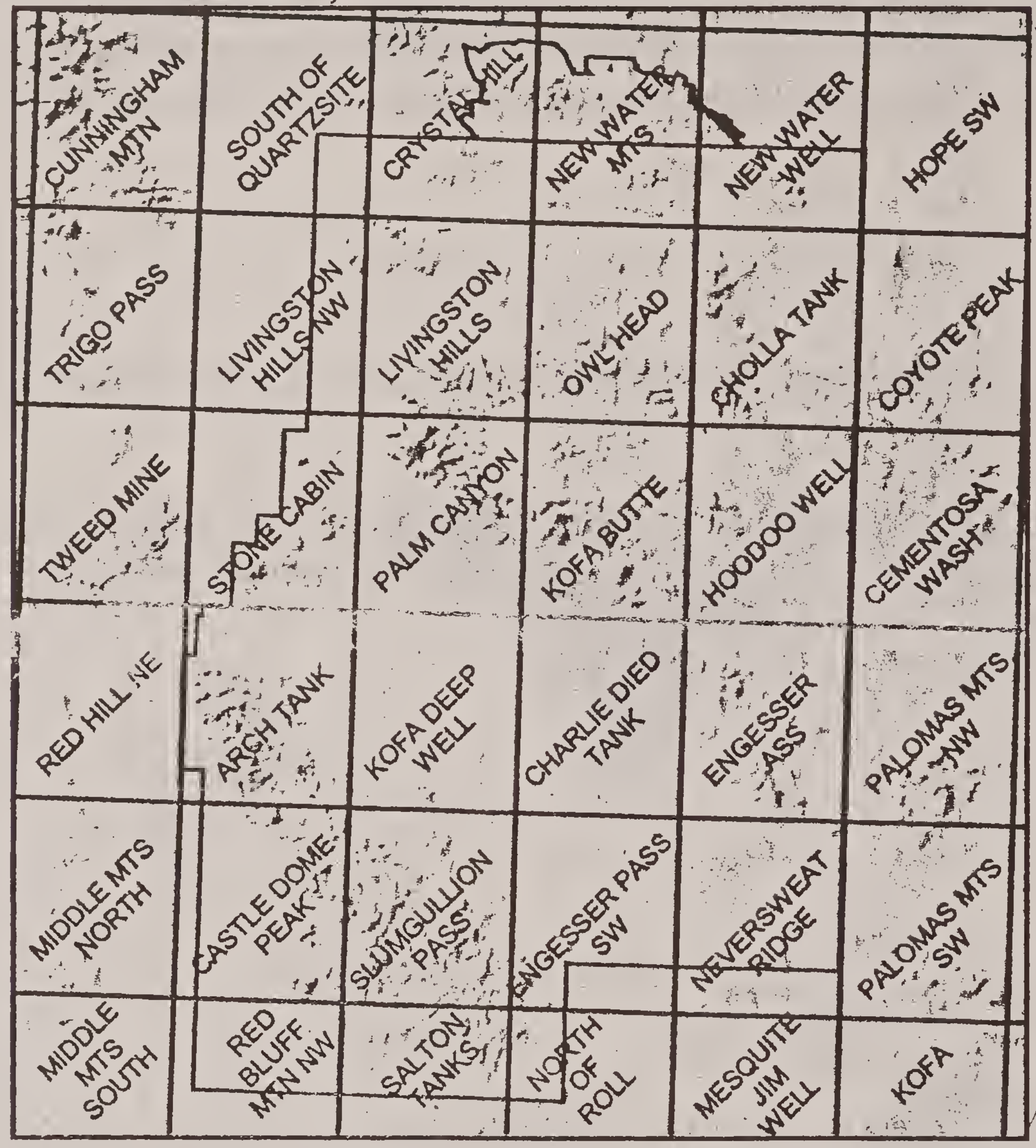
Other concerns:

The spacing in the legend part of the map, between the text and associated tone boxes, is much too large.

There is no base map information (latitude & longitude, township & range, labeled roads, etc.) included, to indicate the location of the data presented. (For a more detailed discussion of these problems, see the *Cartographic Notebook*, page 77.)

Kofa Refuge ar

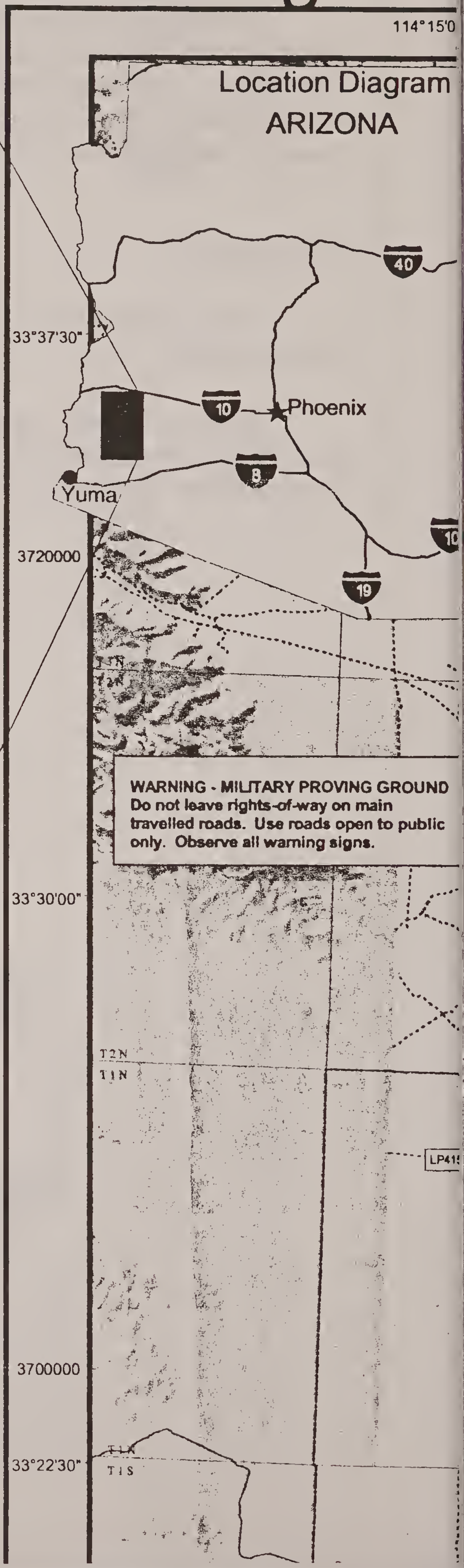
U.S.G.S. 7.5 Minute Topographic Maps
covered by this BLM Wilderness Brochure


CUNNINGHAM MTN
SOUTH OF QUARTZSITE
CRYSTAL HILL
NEW WATER MTS
NEW WATER WELL
HOPE SW
TRIGO PASS
LIVINGSTON HILLS NW
LIVINGSTON HILLS
OWL HEAD
CHOLLA TANK
COYOTE PEAK
TWEED MINE
STONE CABIN
PALM CANYON
KOFA BUTTE
HOODOO WELL
CEMENTOSA WASH
RED HILL NE
ARCH TANK
KOFA DEEP WELL
CHARLIE DIED TANK
ENGESSER ASS
PALOMAS MTS NW
MIDDLE MTS NORTH
CASTLE DOME PEAK
SLUMGULLION PASS
ENGESSER PASS SW
NEVERSWEAT RIDGE
PALOMAS MTS SW
MIDDLE MTS SOUTH
RED BLUFF MTN NW
SALTON TANKS
NORTH OF ROLL
MESQUITE JIM WELL
KOFA

SCALE 1:125000

1 0 1 2 3 4 5 6 7 8 9 10 Miles
1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 Kilometers

September 2000


114°15'0
Location Diagram
ARIZONA
40
10
Phoenix
8
Yuma
10
19
33°37'30"
3720000
33°30'00"
T2N
T1N
LP41
3700000
33°22'30"
T1N
T1S

WARNING - MILITARY PROVING GROUND
Do not leave rights-of-way on main travelled roads. Use roads open to public only. Observe all warning signs.

Legend

MAP 6

Correct spelling on a map is an obvious requirement. This is one of the items that definitely should be covered during an edit. If maps are not reviewed, there is always the potential for an embarrassing spelling error, as on this map. Note in the topographic map index the quad which should be labeled "Engesser Pass" (but is not!). Again, map editing is required to avoid these kinds of mistakes.

Other concerns:

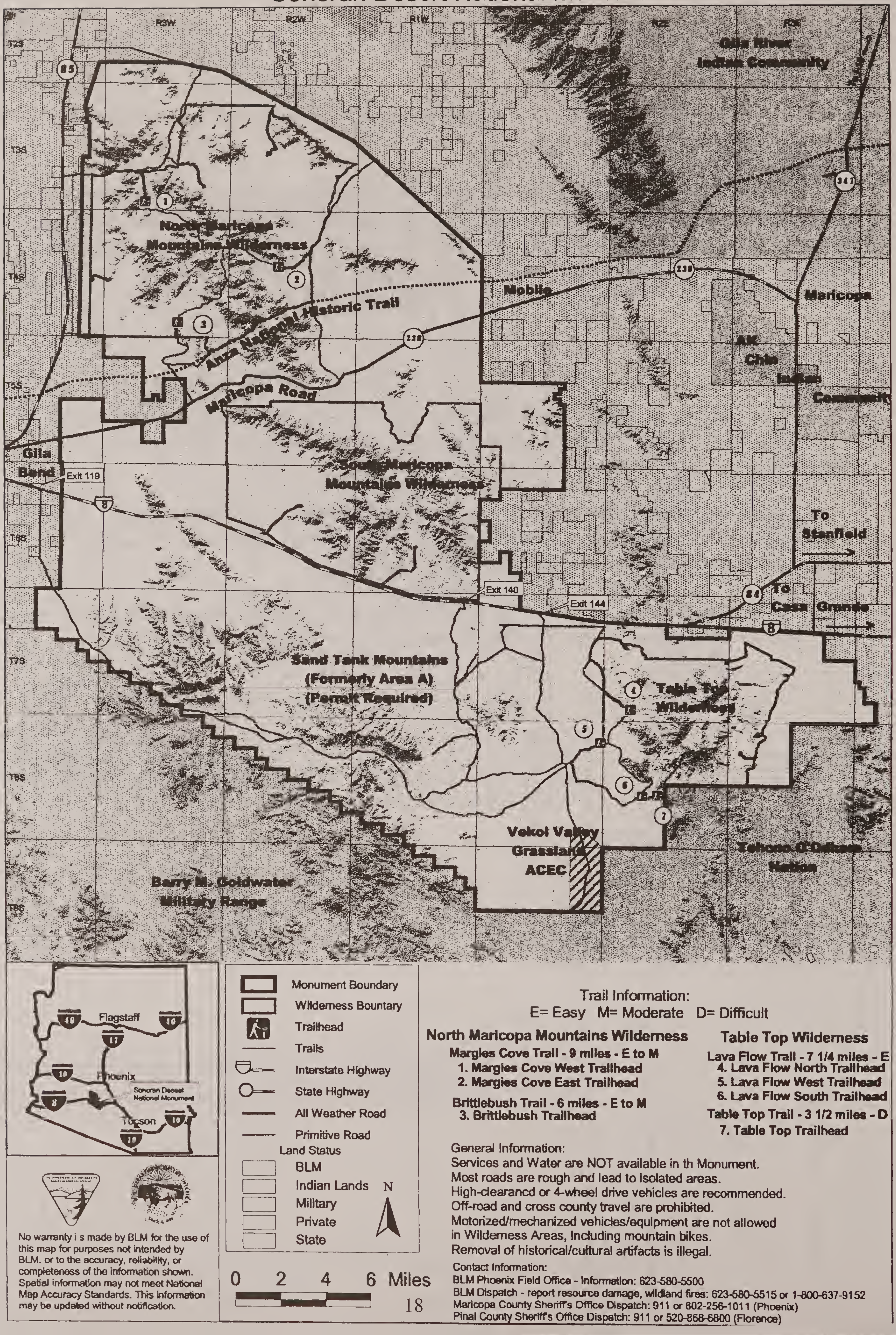
The grid pattern in the topographic map index is crooked. This can lead to a lack of confidence by the reader. ("If they can't get the map straight, what is the chance that the other data presented will be accurate?")

In the scale, every division of the scale bar is labeled with a number (0, 1, 2, 3, 4, 5, etc.). This is a bit of "overkill." The scale would be just as informative – and a lot less cluttered – if only every *even* number were included (0, 2, 4, 6, etc.).

In the compass rose, the letters "N, S, E, W" are inconsistent in spacing. In particular, the "W" and "E" are too low and the "W" is even touching the compass.

MAP 7

Sonoran Desert National Monument


R3W
R2W
R1W
R2E
R3E
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
85
347
238
238
84
8
8
Gila River Indian Community
North Maricopa Mountains Wilderness
Mobile
Maricopa
Anza National Historic Trail
Maricopa Road
Ak Chin Indian Community
Gila Bend
Exit 119
South Maricopa Mountains Wilderness
To Stanfield
Exit 140
Exit 144
To Casa Grande
Sand Tank Mountains (Formerly Area A) (Permit Required)
Table Top Wilderness
Vekol Valley Grassland ACEC
Tohono O'Odham Nation
Barry M. Goldwater Military Range
1
2
3
4
5
6
7
Flagstaff
Phoenix
Tucson
40
40
17
10
10
8
19
Sonoran Desert National Monument
Monument Boundary
Wilderness Bountary
Trailhead
Trails
Interstate Highway
State Highway
All Weather Road
Primitive Road
Land Status
BLM
Indian Lands
Military
Private
State
N
0 2 4 6 Miles

Trail Information:
E= Easy M= Moderate D= Difficult

North Maricopa Mountains Wilderness

Margies Cove Trail - 9 miles - E to M
1. **Margies Cove West Trailhead**
2. **Margies Cove East Trailhead**

Brittlebush Trail - 6 miles - E to M
3. **Brittlebush Trailhead**

Table Top Wilderness

Lava Flow Trail - 7 1/4 miles - E
4. **Lava Flow North Trailhead**
5. **Lava Flow West Trailhead**
6. **Lava Flow South Trailhead**

Table Top Trail - 3 1/2 miles - D
7. **Table Top Trailhead**

General Information:
Services and Water are NOT available in th Monument.
Most roads are rough and lead to isolated areas.
High-clearancd or 4-wheel drive vehicles are recommended.
Off-road and cross county travel are prohibited.
Motorized/mechanized vehicles/equipment are not allowed
in Wilderness Areas, Including mountain bikes.
Removal of historical/cultural artifacts is illegal.

Contact Information:
BLM Phoenix Field Office - Information: 623-580-5500
BLM Dispatch - report resource damage, wildland fires: 623-580-5515 or 1-800-637-9152
Maricopa County Sheriff's Office Dispatch: 911 or 602-256-1011 (Phoenix)
Pinal County Sheriff's Office Dispatch: 911 or 520-868-6800 (Florence)

No warranty i s made by BLM for the use of this map for purposes not intended by BLM. or to the accuracy, reliability, or completeness of the information shown. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

MAP 7

This map has been reduced from its printed size of 11" X 17" for reproduction here. The original is in color. The main problem with the text is a *sameness* of size, style, and boldness. Note that labels for wilderness, Indian communities, military, towns, roads, trails, and in fact practically all of the features are the same. Although the map is quite readable, a selection of type styles (used with different sizes and boldness) would help the reader to differentiate between the various items presented. It would also assist in accentuating the more important parts of the map.

Other concerns:

In the location diagram, the text for "Phoenix" and "Tucson" should be shifted so they aren't covered by the interstate road lines.

The BLM and Department of the Interior logos could be switched, as the Department is the parent organization and should come first.

In the legend, "Monument Boundary" and "Wilderness Boundary" should be portrayed as lines, not boxes (they are *linear*, not *area* designations).

Also in the legend, the road shields could be *centered* on the highway lines rather than located on the left side – for better balance.

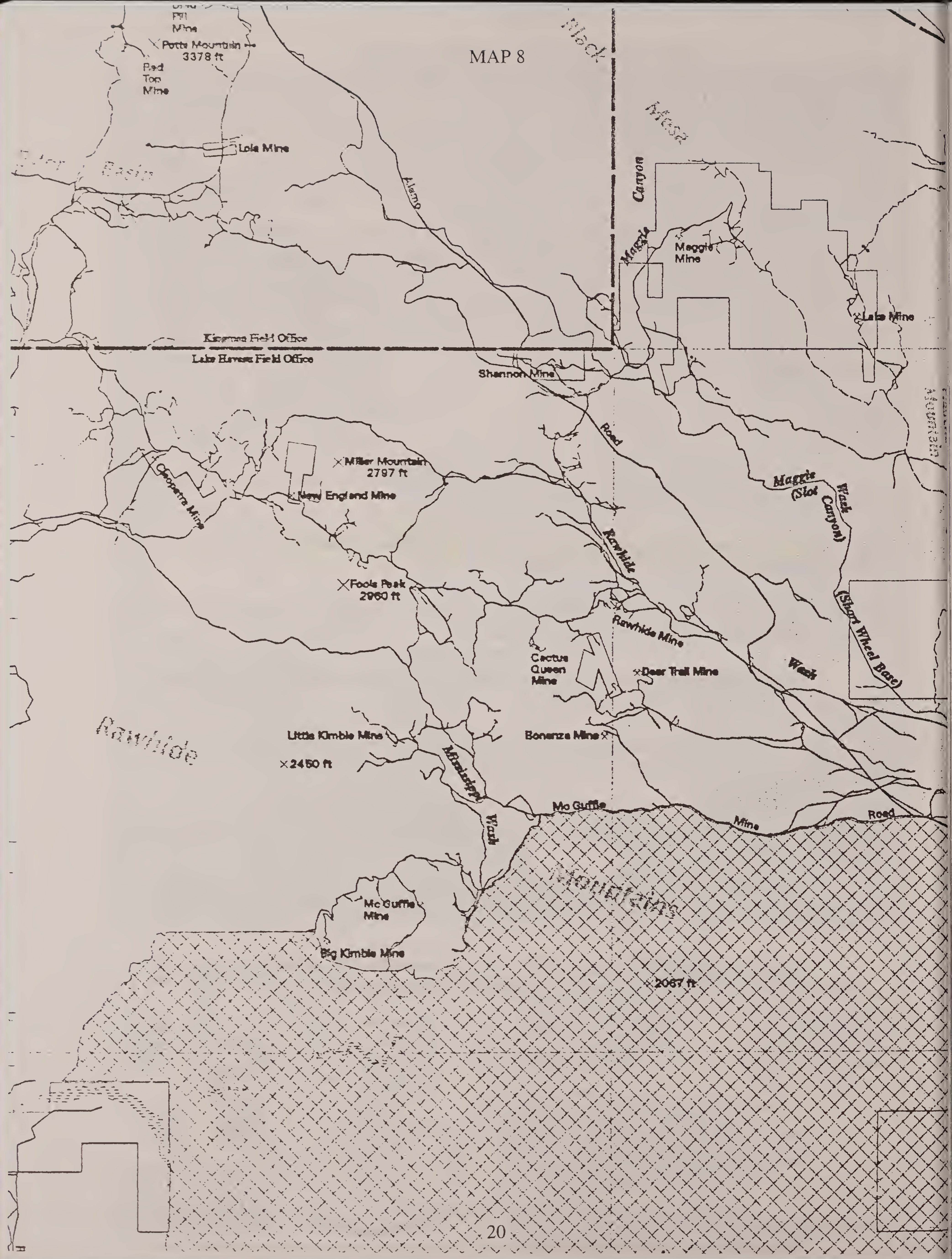
The scale and its associated text are too large in size. They are out of proportion with the rest of the map. (Also, the scale bar may be slightly incorrect in its length.)

There are a few text problems present such as incorrectly spelled words, poor punctuation, words used improperly ("cross county" for "cross country"), and some questionable sentence structure.

Some italic text is used for non hydrographic features (for example, on road designation shields).

On the map some text could be shifted to better locations and clarified. Also, the trailhead symbols should be the same size in both the legend and on the map.

MAP 8


Pill
Mine
Potts Mountain
3378 ft
Red
Top
Mine
Lola Mine
Basin
Alamo
Black
Mesa
Maggie
Canyon
Maggie
Mine
Lake Mine
Kingman Field Office
Lake Havasu Field Office
Shannon Mine
Road
Mountain
Miller Mountain
2797 ft
New England Mine
Cleopatra Mine
Maggie
(Slot
Canyon)
Wash
(Short Wheel Base)
Rawhide
Fools Peak
2960 ft
Rawhide Mine
Wash
Cactus
Queen
Mine
Deer Trail Mine
Rawhide
Little Kimble Mine
Bonanza Mine
2450 ft
Mississippi
Wash
McGuffie
Mine
Road
Mountains
McGuffie
Mine
Big Kimble Mine
2067 ft

MAP 8

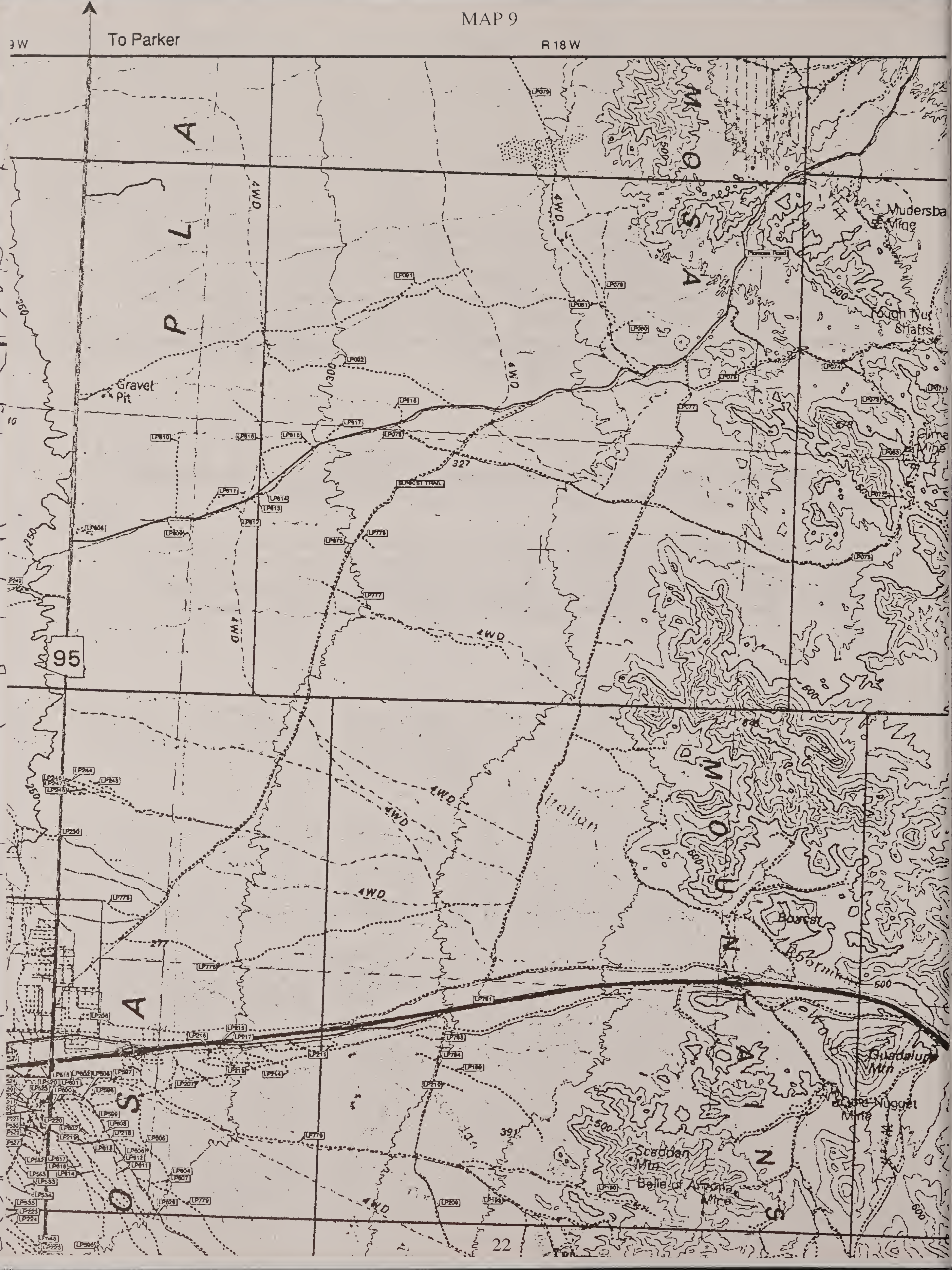
Map 8 is part of a larger map and is shown here at the original size. The problem is the small size of the text, considering the space that is available. As can be seen, the type could have been made at least a couple of points larger and easily fitted into the ample open space that is present. This would have made the map easier to read. In addition, the text is a bit blocky and is starting to "close up," even in this reproduction. A larger size type would have helped to alleviate this problem, to some degree. A better solution would be to adjust the spacing between the letters to allow a little more room between them.

Other concerns:

The text for "Kingman Field Office" and "Lake Havasu Field Office" should probably be larger, as the boundary line between them is a major feature on the map.

On the center right side of the map, the text for "Maggie Wash" and "(Slot Canyon)" should be smoothed considerably. (More will be said about this type of problem in later maps.) Also, it is appropriate to use italic text for "Maggie Wash" since it is a hydrographic feature. However, "Slot Canyon" is not a fluvial landform as such, so it should not be in italics.

MAP 9


To Parker
9 W
R 18 W
P
L
A
P
A
S
O
M
O
S
A
M
O
U
N
T
A
I
N
S
4WD
4WD
4WD
4WD
4WD
4WD
4WD
4WD
Gravel Pit
95
250
250
250
300
327
277
391
500
500
500
500
600
600
600
600
Mudersbach Mine
Tough Nut Shafts
Clima Mine
Plomosa Road
SUNRISE TRAIL
LP079
LP081
LP078
LP080
LP082
LP074
LP076
LP071
LP077
LP075
LP083
LP072
LP073
LP618
LP617
LP616
LP615
LP610
LP611
LP614
LP613
LP612
LP606
LP609
LP776
LP675
LP777
LP240
LP244
LP243
LP236
LP779
LP778
LP206
LP218
LP217
LP216
LP211
LP214
LP213
LP207
LP210
LP781
LP783
LP784
LP189
LP190
LP198
LP806
LP804
LP807
LP779
Italian
Bouse Wash
Bobcat
Bootmik
Guadalupe Mtn
Gold Nugget Mine
Scaddan Mtn
Belle of Arizona Mine

MAP 9

This is part of a larger map that demonstrates a difficulty often encountered when compiling cartographic data. The problem is *cut off words* at the edge of the map. Note the vertical text "PLA" and "MOSA" at the top of the map. These are part of the labels for "PLAIN" ("La Posa Plain" in its entirety) and "PLOMOSA" (for "Plomosa Mountains"). They were "cut off" during the construction of this map.

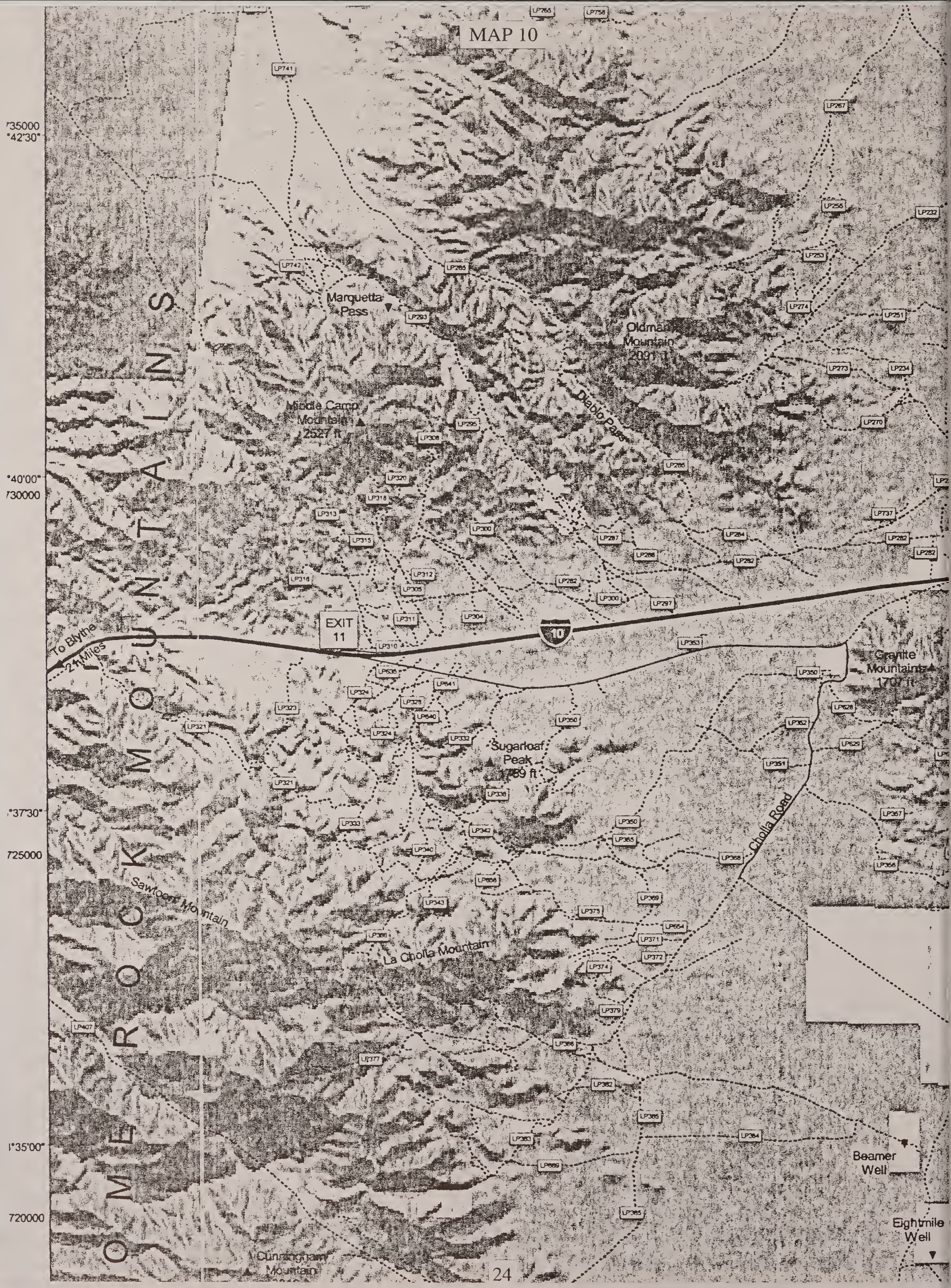
When you are creating a map from other cartographic bases and source data, be sure that none of the text is truncated or cut off at the edges of the map. Either eliminate the text if it is not needed or is already duplicated elsewhere, or replace it on the map in an appropriate location.

Other concerns:

The text (partially cut) for "LA POSA PLAIN" and "PLOMOSA MOUNTAINS" should not be in italic. Cartographic convention requires that only hydrographic features be in italic text.

Some of the text and linework are hard to see on this map.

MAP 10

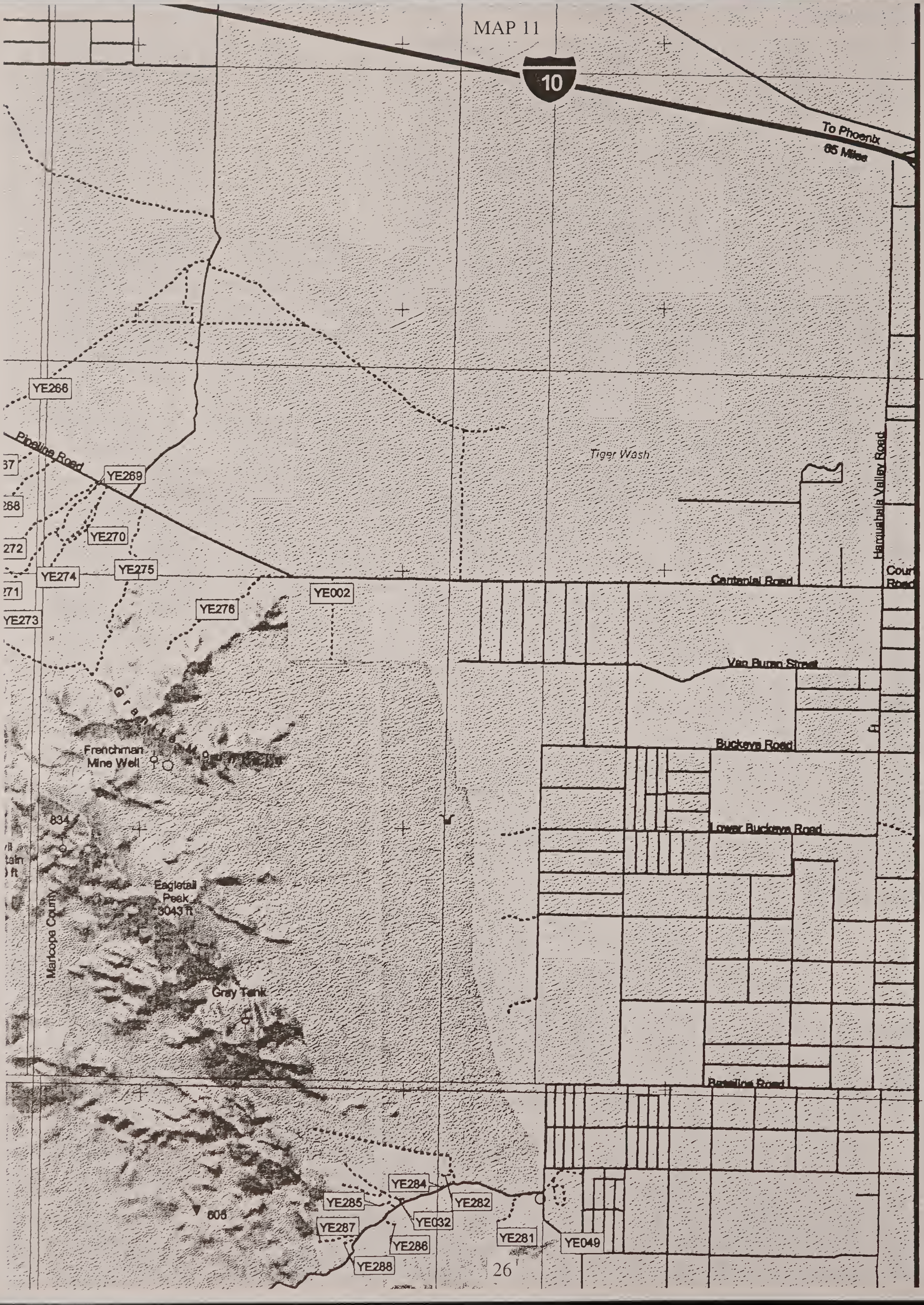

735000
42'30"
40'00"
730000
37'30"
725000
35'00"
720000
MULE MOUNTAINS (lettered bottom to top: O M E R O K M O U N T A I N S)
LP741
LP265
LP758
LP267
LP256
LP232
LP742
LP266
LP253
Marquetta Pass
LP293
LP274
LP251
Oldman Mountain 2091 ft
LP273
LP234
Diablo Pass
Middle Camp Mountain 2527 ft
LP295
LP308
LP270
LP265
LP320
LP318
LP313
LP300
LP737
LP287
LP284
LP315
LP288
LP282
LP282
LP282
LP312
LP316
LP305
LP282
LP300
LP297
EXIT 11
LP311
LP304
10
To Blythe 21 Miles
LP310
LP353
Granite Mountains 1707 ft
LP635
LP350
LP641
LP324
LP328
LP323
LP628
LP640
LP321
LP350
LP324
LP352
LP332
Sugarloaf Peak 1789 ft
LP629
LP351
LP321
LP336
Cholla Road
LP333
LP350
LP357
LP342
LP365
LP340
LP356
LP356
Sawtooth Mountain
LP656
LP343
LP369
LP373
LP654
LP368
LP371
La Cholla Mountain
LP372
LP374
LP379
LP407
LP366
LP377
LP382
LP385
LP383
LP384
Beamer Well
LP669
LP385
Eightmile Well
Cunningham Mountain

MAP 10

Map 10 considers another aspect of text placement. Look at the word "MOUNTAINS," running vertically on the left side of the map. The letter "U" in "mountains" is exactly split by the Interstate 10 highway. This should not have happened. The text for "mountains" should be shifted so the highway runs *between* the letters. For ease of readability, try to avoid placing text on top of other map linework whenever possible. This could easily have been done on this map, where there is plenty of space to work with.

Other concerns:

The letter spacing in "DOME ROCK MOUNTAINS" is just a little wide. It would probably read better (be more quickly understood at first glance) if the letters were slightly closer together.



MAP 11

10
To Phoenix
65 Miles
37150
37100
33°30
37050
37000
36950
33°22
Pipeline Road
YE266
67
YE269
268
YE270
272
YE274
YE275
271
YE273
YE276
YE002
Tiger Wash
Harquahala Valley Road
Centennial Road
Van Buren Street
Buckeye Road
Lower Buckeye Road
Baseline Road
Granite
Frenchman Mine Well
834
Eagletail Peak 3043 ft
Maricopa County
Gray Tank
606
YE284
YE285
YE032
YE282
YE287
YE286
YE281
YE049
YE288

MAP 11

When placing location designation text on a map, avoid touching the feature that is being labeled. As an example, note the roads along the right side of this map: "Centenial Road, Van Buren Street, Buckeye Road, Lower Buckeye Road, Baseline Road, and Harquahala Valley Road." In each case the road label touches the road and makes it more difficult to read. There is no reason for this. A small space should always separate the text from the feature. Note the "To Phoenix" and "65 Miles" labels in the upper right corner. These are correct in allowing space between the text and the highway (although the spacing here could have been more consistent).

Other concerns:

The letter spacing in the words on this map is very tight and is starting to "close up." The text should be adjusted to allow more space between letters.

"Court Road" (which should actually be "Courthouse Road") is cut off at the right edge of the map.

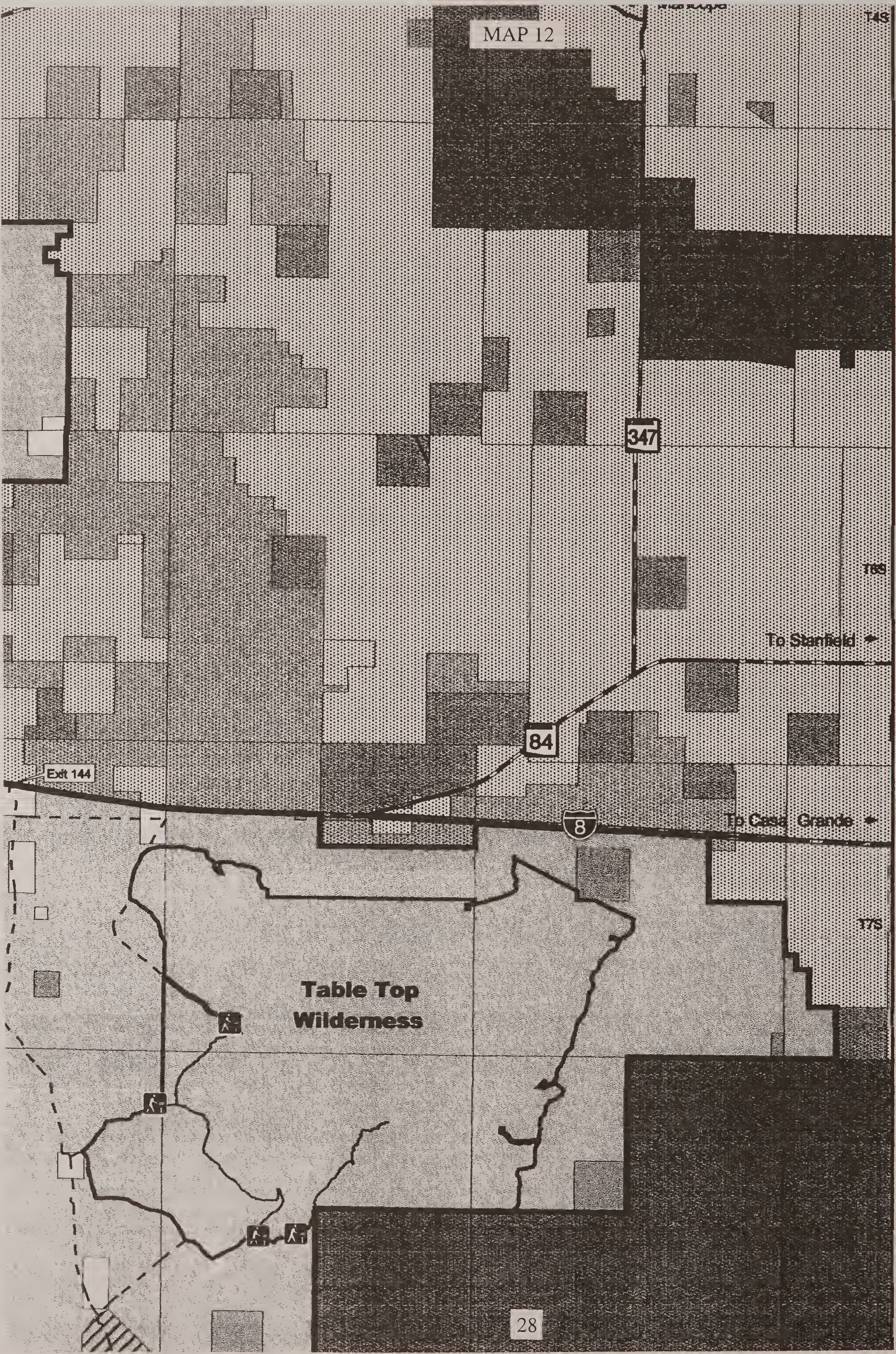
Note the arc of the text for "Granite Mountain." This is nicely done but if the label had been shifted slightly above the mountain ridge, the mountains would be more visible (instead of having to look *through* the label).

The text for "Gray Tank" is located too far away from the symbol for the tank.

I would suggest adding a small triangle "▲" to show the actual location of Eagletail Peak. Otherwise it is difficult to establish the exact position of the peak along the high mountain ridge. Adding these peak designation triangles is probably a good idea to indicate locations of specific peaks on any map that contains mountain ranges.

The directional arrow is missing on the Interstate 10 highway, to accompany the "To Phoenix 65 Miles" text.

MAP 12


T4S
347
T6S
To Stanfield
84
Exit 144
8
To Casa Grande
T7S
Table Top
Wilderness

MAP 12

In Map 12 a shading pattern was overlayed on part of the map to help accentuate certain areas. Unfortunately, this has had the effect of making some of the text hard to read. Note that "To Stanfield" and "To Casa Grande" are quite hard to see, while their associated arrows are reduced to just amorphous "blots." The township numbers down the right side of the map are also difficult to make out.

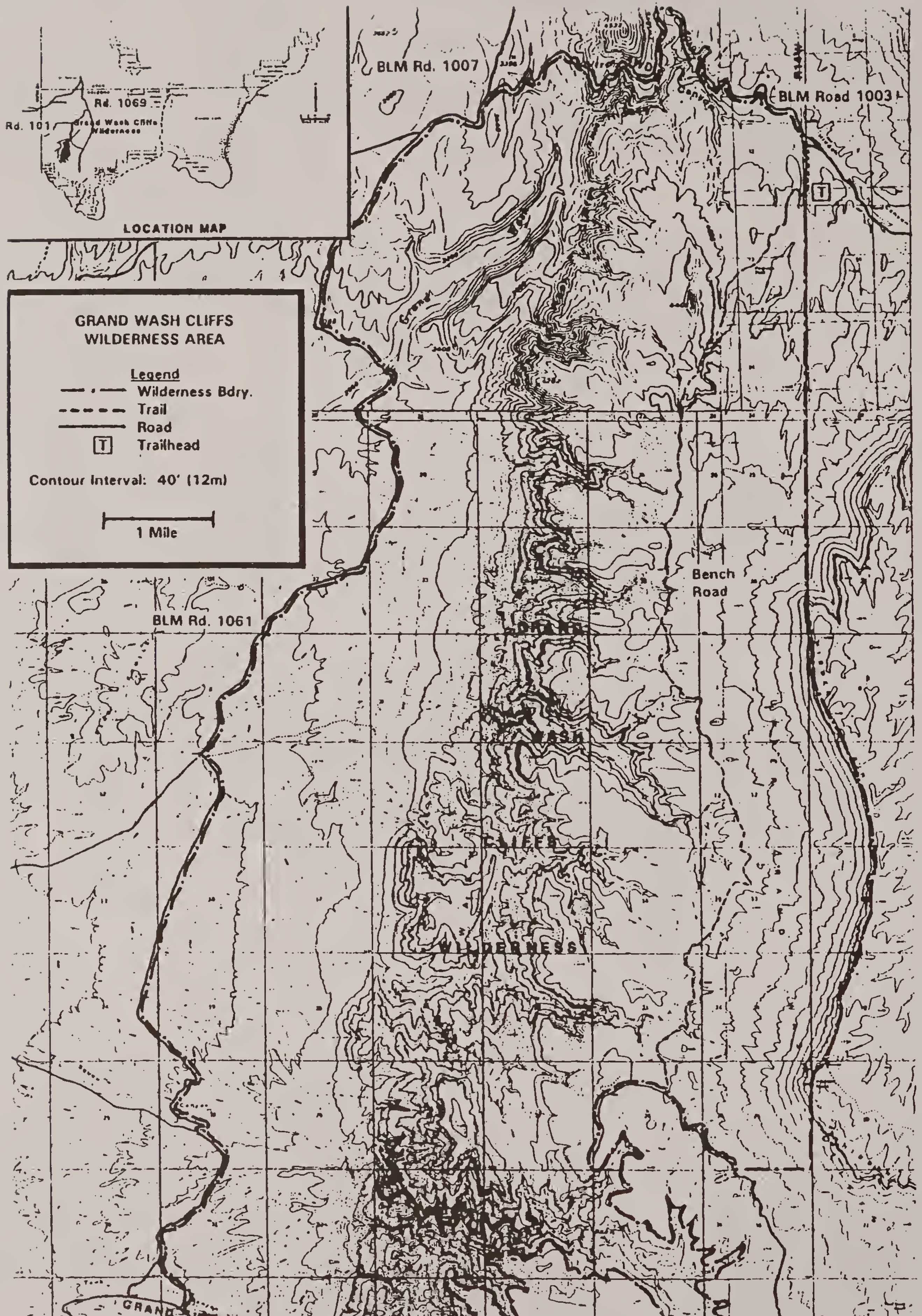
The solution to this problem would be to use some other technique (bold boundary lines, for example) and avoid the shading pattern altogether. An alternative approach would be to allow a slight amount of white space around the text letters (a "ghosting" effect) so that they are visible without the obstructing pattern overlay. (See Appendix IV for more information on this.)

Other concerns:

The interpretive trail symbols in the "Table Top Wilderness" are quite small – almost to the point where the symbol picture is about to "block up." I recommend producing these symbols at a size of at least one-quarter inch square (assuming no further map reduction) for ease of reproduction and visibility.

The Arizona state road shields – "84" and "347" – are poorly rendered (they are supposed to depict an Arizona State outline). Either a better shield symbol should be selected or just a plain circle should be substituted. Note also that the "347" shield is not properly centered on the north-south trending highway.

MAP 13


Rd. 1069
Rd. 101
Grand Wash Cliffs Wilderness
LOCATION MAP
GRAND WASH CLIFFS
WILDERNESS AREA
Legend
Wilderness Bdry.
Trail
Road
T Trailhead
Contour Interval: 40' (12m)
1 Mile
BLM Rd. 1007
BLM Road 1003
T
Bench
Road
BLM Rd. 1061
GRAND
WASH
CLIFFS
WILDERNESS
GRAND

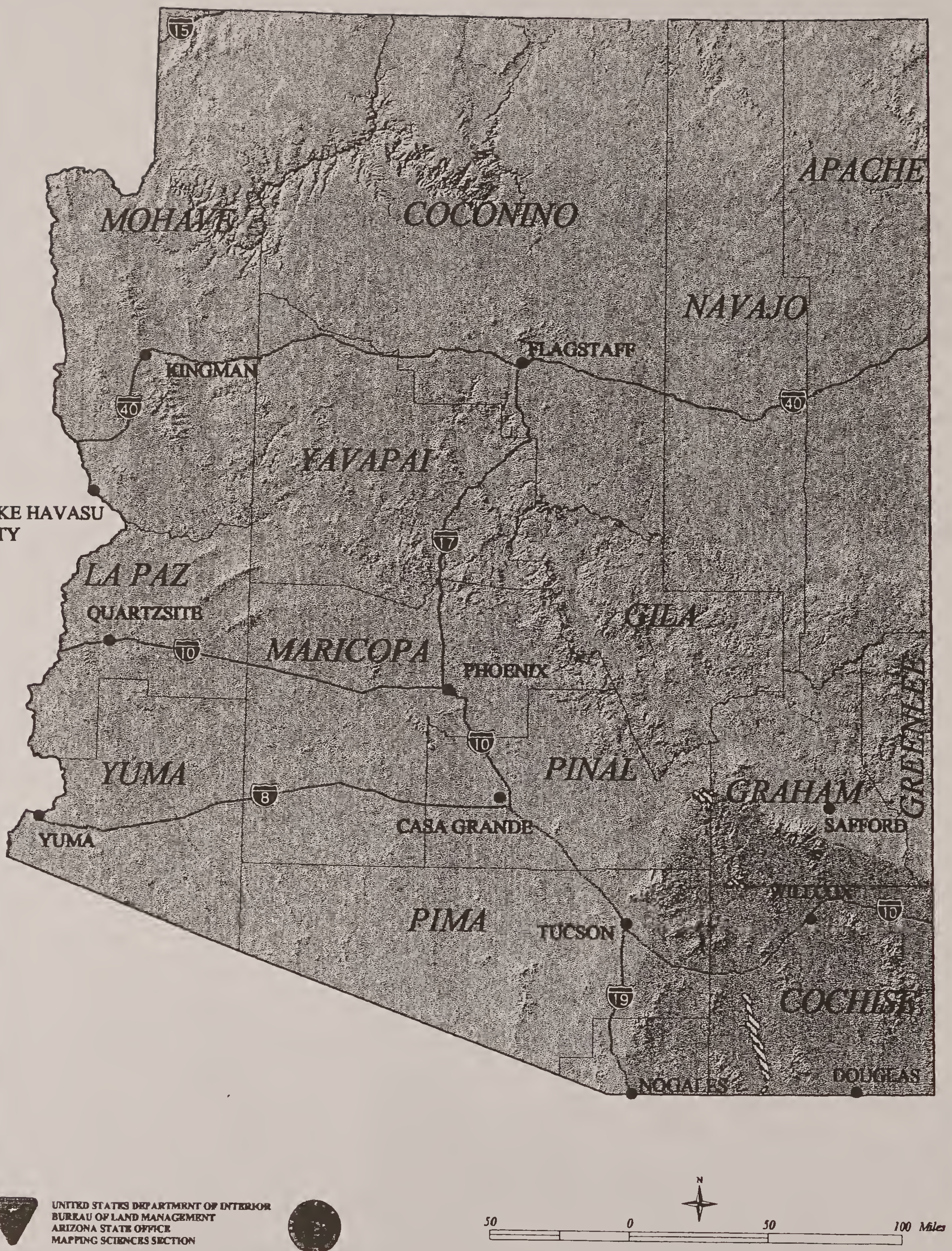
MAP 13

When placing text on a map it is important to be able to *see* the text over the background base data, whether it is in black & white or color. There must be enough contrast so that the text is visible. This map (which is reduced to 60% of its original size) is a good example of a lack of contrast. Note how the contour lines obscure much of the wording. Even the primary name of the feature mapped "Grand Wash Cliffs Wilderness" (located in the center) is hard to read. A white background to the labels on this map is required, in order for them to be legible.

Other concerns:

Even at its original size, much of the text on this map is way too small. For example, note the "Location Map." Most of the labels here are totally unreadable. (For more comments on this map, see the *Cartographic Notebook*, pages 94-97.)

MAP 14


15
APACHE
MOHAVE
COCONINO
NAVAJO
FLAGSTAFF
KINGMAN
40
40
YAVAPAI
LAKE HAVASU CITY
17
LA PAZ
QUARTZSITE
10
MARICOPA
GILA
PHOENIX
GREENLEE
10
YUMA
PINAL
GRAHAM
8
SAFFORD
CASA GRANDE
YUMA
WILLCOX
10
PIMA
TUCSON
19
COCHISE
NOGALES
DOUGLAS
N
50
0
50
100 Miles

UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
ARIZONA STATE OFFICE
MAPPING SCIENCES SECTION

PROPOSED RAPARIAN ACQUISITION AREA KEY MAP

MAP 14

Names on a map should generally include the category of feature they are designating. In this case the counties of Arizona are displayed, but without the word "county" accompanying them. This could lead to confusion by a reader who is not familiar with Arizona. For example "Navajo" might be mistaken for the Navajo Indian Reservation, rather than Navajo County. Likewise, Apache County could be confused with the Apache Indian Reservation. (This would be most likely to happen on a large scale map, where only one or two of the county names appear.) It is best to always use the word "county" with each county name.

Another problem with the county names on this map is that they are in italic type. Cartographic convention reserves italics for hydrographic (water-related) features only.

Other concerns:

The scale bar text should not be in italics (for the same reason as noted above).

The spacing between the city names and the dots showing their locations is inconsistent across the map.

The title and other text at the bottom of the map could be made larger; there is adequate space available.

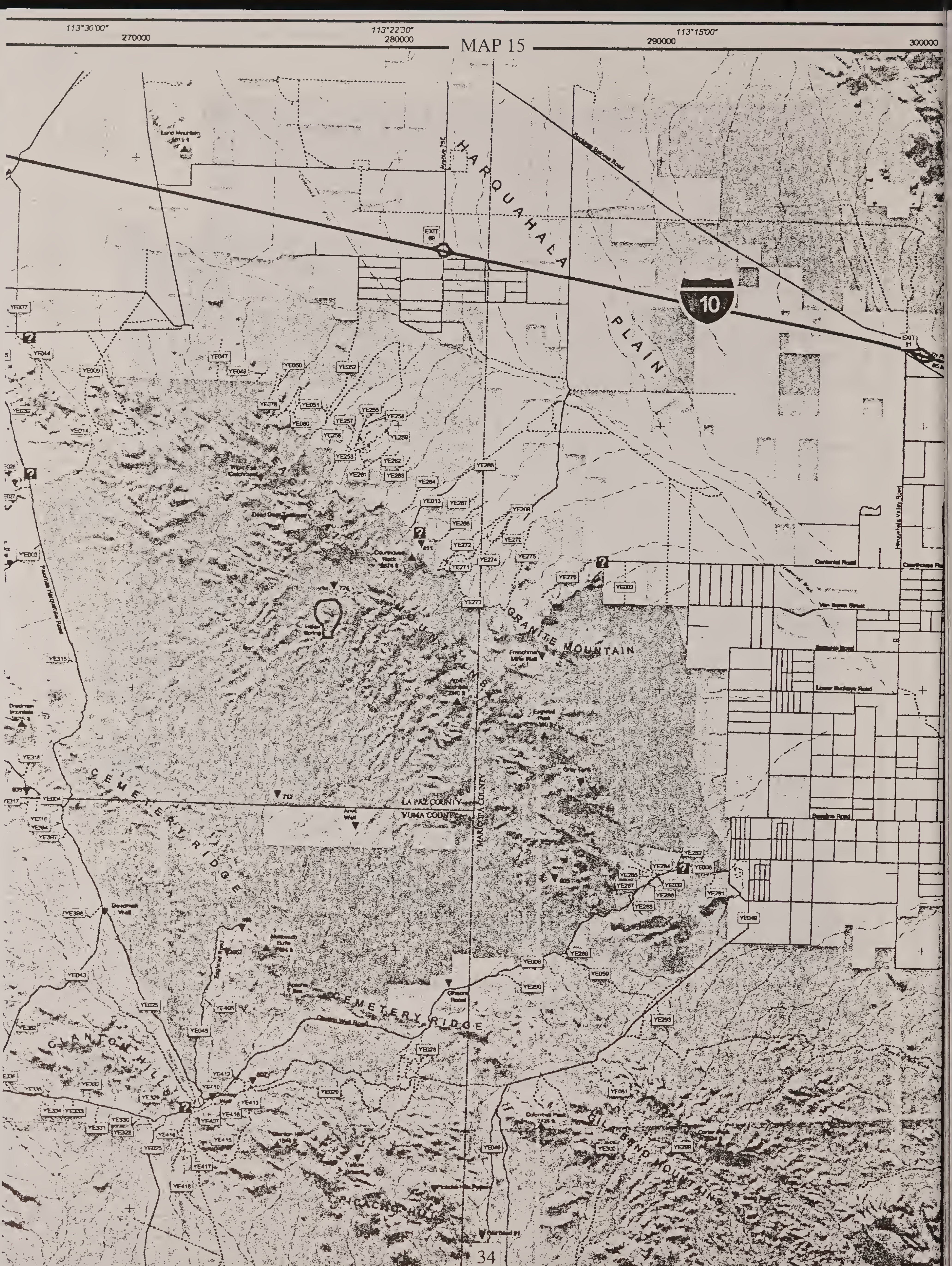
The title indicates that there are proposed riparian acquisition areas shown on the map but since they are not indicated in the legend, the reader won't know where to look for them. (They are apparently the very small hachured areas on the map.)

"United States Department of Interior" should read "United States Department of *the* Interior."

The logos could be reversed in location since the Department of the Interior is the parent organization of the Bureau of Land Management and should consequently be first in order of precedence.

What is the small text in the extreme lower right corner? If it is important it should be made readable, otherwise it should be omitted.

MAP 15


113°30'00"
270000
113°22'30"
280000
113°15'00"
290000
300000
Lone Mountain
Avenue 75E
HARQUAHALA PLAIN
EXIT 69
10
EXIT 81
Harquahala Valley Road
Centennial Road
Courthouse Ro
Van Buren Street
Lower Buckeye Road
Baseline Road
Palomas Harquahala Road
EAGLE TAIL MOUNTAINS
GRANITE MOUNTAIN
Triple Eye Catchment
Dead Deer Tank
Courthouse Rock
Indian Spring
726
411
Frenchman Mine Well
Anvil Mountain 2340 ft
Eagletail Peak
Gray Tank
Deadman Mountain
712
LA PAZ COUNTY
YUMA COUNTY
MARICOPA COUNTY
Anvil Well
605
CEMETERY RIDGE
Deadman Well
Rattlesnake Butte
Apache Box
Gibson Road
Clanton Well Road
CLANTON HILLS
Clanton Hill 1948 ft
Clanton Well
Yellow Breast
PICACHO HILLS
Columbus Peak 2428 ft
Cortez Peak
GILA BEND MOUNTAINS
Oil Seed #1
YE007
YE044
YE009
YE047
YE049
YE050
YE052
YE032
YE014
YE078
YE051
YE080
YE255
YE258
YE257
YE256
YE259
YE253
YE262
YE261
YE263
YE264
YE266
YE013
YE267
YE268
YE269
YE270
YE272
YE274
YE275
YE271
YE276
YE002
YE273
YE003
YE315
YE318
YE004
YE317
YE316
YE394
YE397
YE398
YE043
YE025
YE405
YE045
YE382
YE282
YE284
YE006
YE285
YE287
YE032
YE286
YE281
YE288
YE040
YE289
YE059
YE290
YE293
YE028
YE412
YE410
YE413
YE020
YE332
YE329
YE334
YE333
YE330
YE331
YE328
YE407
YE416
YE418
YE415
YE025
YE417
YE418
YE040
YF051
YE300
YE299

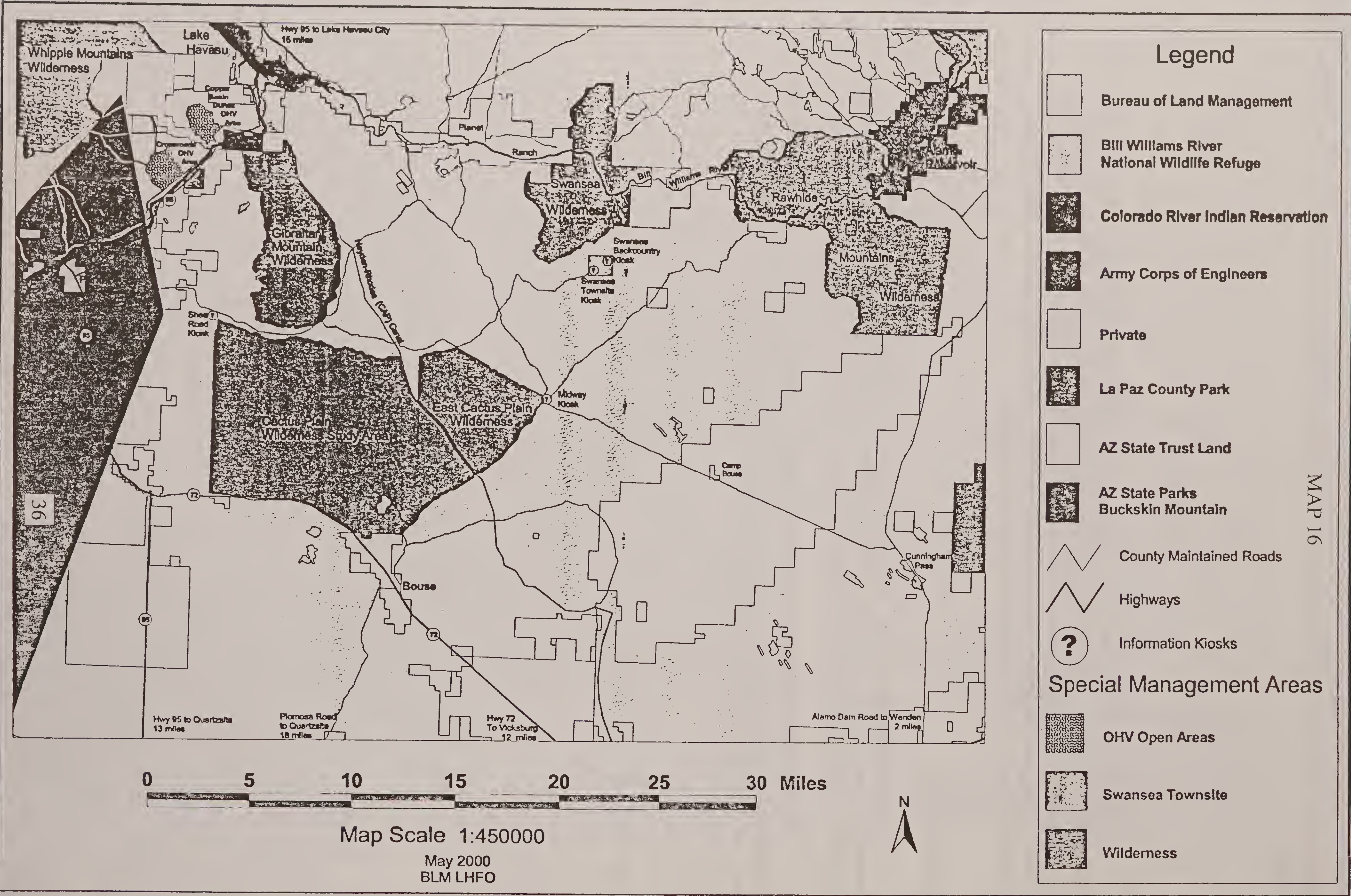
MAP 15

This is part of a larger map that has been reduced to 60% of original size. What I want to point out here is the fact that the Interstate 10 shield is way out of proportion to the rest of the information on the map. Because of its extremely large size, you would think that it is the entire reason for the map. Remember, the size of text and symbols on a map connotes *importance*. You should always plan and adjust your maps accordingly.

Other concerns:

Note that the numeral "10" within the Interstate 10 shield is not centered correctly. It should be moved slightly to the left. Also, the shield is situated slightly "high" on the highway. It could be moved down a very small amount so that it is evenly bisected by the highway line.

To summarize the points discussed here: highway shields should be of an appropriate size (depending upon their importance to the map subject), they should be centered on the highway line, and their number designation should be centered within the shield.


Whipple Mountains Wilderness
Lake Havasu
Hwy 95 to Lake Havasu City 15 miles
Copper Basin Dunes OHV Area
Crossroads OHV Area
Planet
Ranch
Swansea Wilderness
Bill Williams River
Alamo Reservoir
Rawhide Mountains Wilderness
Gibraltar Mountain Wilderness
Swansea Backcountry Kiosk
Swansea Townsite Kiosk
Shea Road Kiosk
Hayden-Rhodes (CAP) Canal
Midway Kiosk
East Cactus Plain Wilderness
Cactus Plain Wilderness Study Area
Camp Bouse
Cunningham Pass
Bouse
95
72
Hwy 95 to Quartzsite 13 miles
Plomosa Road to Quartzsite 18 miles
Hwy 72 To Vicksburg 12 miles
Alamo Dam Road to Wenden 2 miles
Legend
Bureau of Land Management
Bill Williams River National Wildlife Refuge
Colorado River Indian Reservation
Army Corps of Engineers
Private
La Paz County Park
AZ State Trust Land
AZ State Parks Buckskin Mountain
County Maintained Roads
Highways
Information Kiosks
Special Management Areas
OHV Open Areas
Swansea Townsite
Wilderness
0
5
10
15
20
25
30 Miles
N
Map Scale 1:450000
May 2000
BLM LHFO

MAP 16

MAP 16

The map shown here is reduced from its original 18" X 28" size. The main problem is that the text is out of proportion. It is large in the legend (and the scale bar is especially oversized) and small on the map. A more balanced approach is needed. After all, the map is the important part of this illustration. The legend and scale bar only *explain* the map. Consequently all the important text on the map should be *at least* as large as the legend text.

Other concerns:

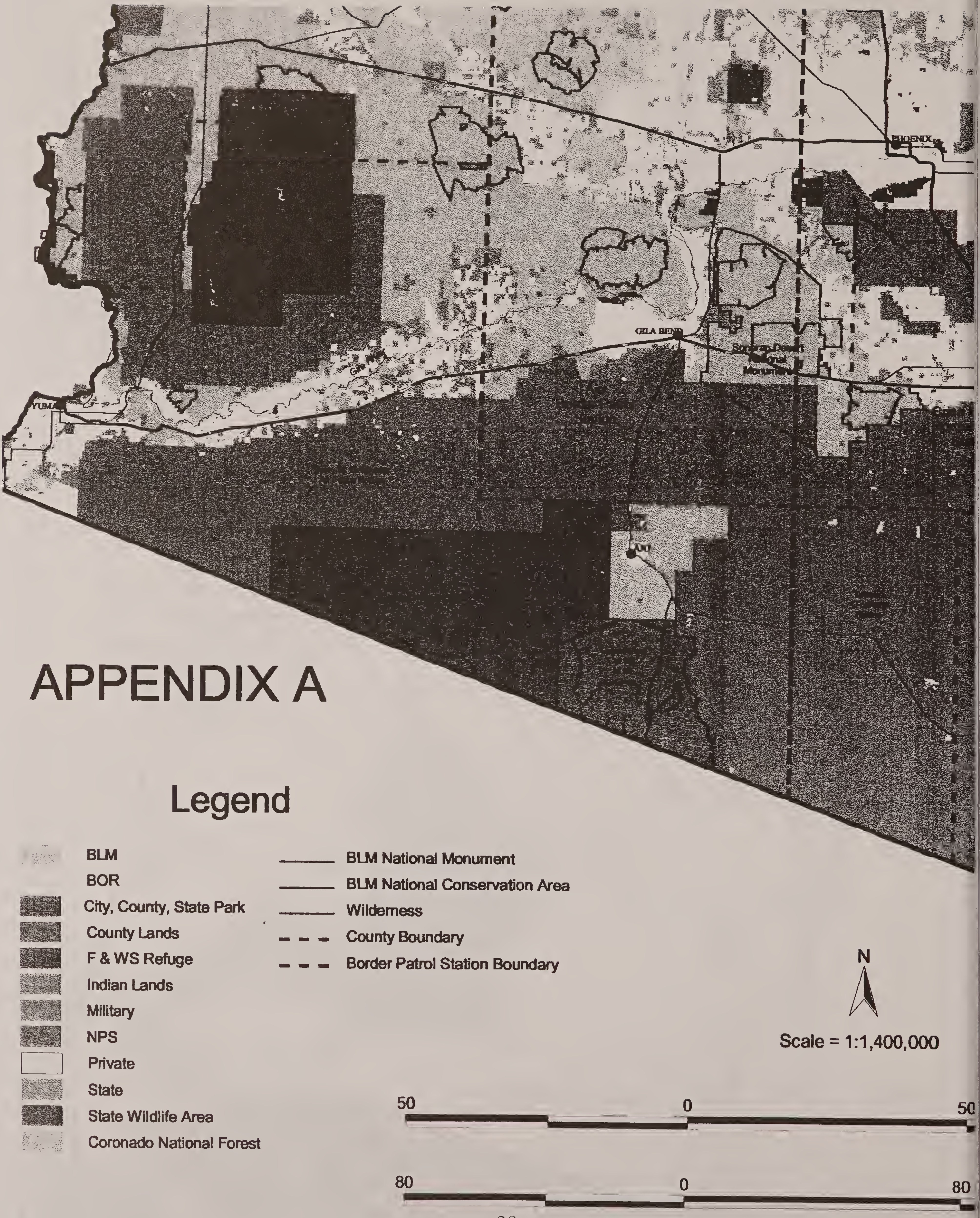
The zigzag lines depicted in the legend as "County Maintained Roads" and "Highways" should be replaced with *straight* lines. (The zigzag lines actually indicate that the lines on the map look like that, which they, of course, do not.)

The "Information Kiosks" symbol in the legend is much too large. Similar symbols in the legend and on the map should always be the *same size* to avoid confusion by the reader.

The general public will probably not know what the abbreviation "LHFO" at the bottom of the map means. Abbreviations should be written out unless they are *extremely common* knowledge. (It is probably not a bad idea to also write out "BLM" on maps that are to be widely circulated. Not everyone – particularly in the East – is familiar with the "Bureau of Land Management.")

MAP 17

APPENDIX A


YUMA
PHOENIX
GILA BEND
Gila River
Sonoran Desert National Monument
AJO
Legend
BLM
BOR
City, County, State Park
County Lands
F & WS Refuge
Indian Lands
Military
NPS
Private
State
State Wildlife Area
Coronado National Forest
BLM National Monument
BLM National Conservation Area
Wilderness
County Boundary
Border Patrol Station Boundary
N
Scale = 1:1,400,000
50
0
50
80
0
80

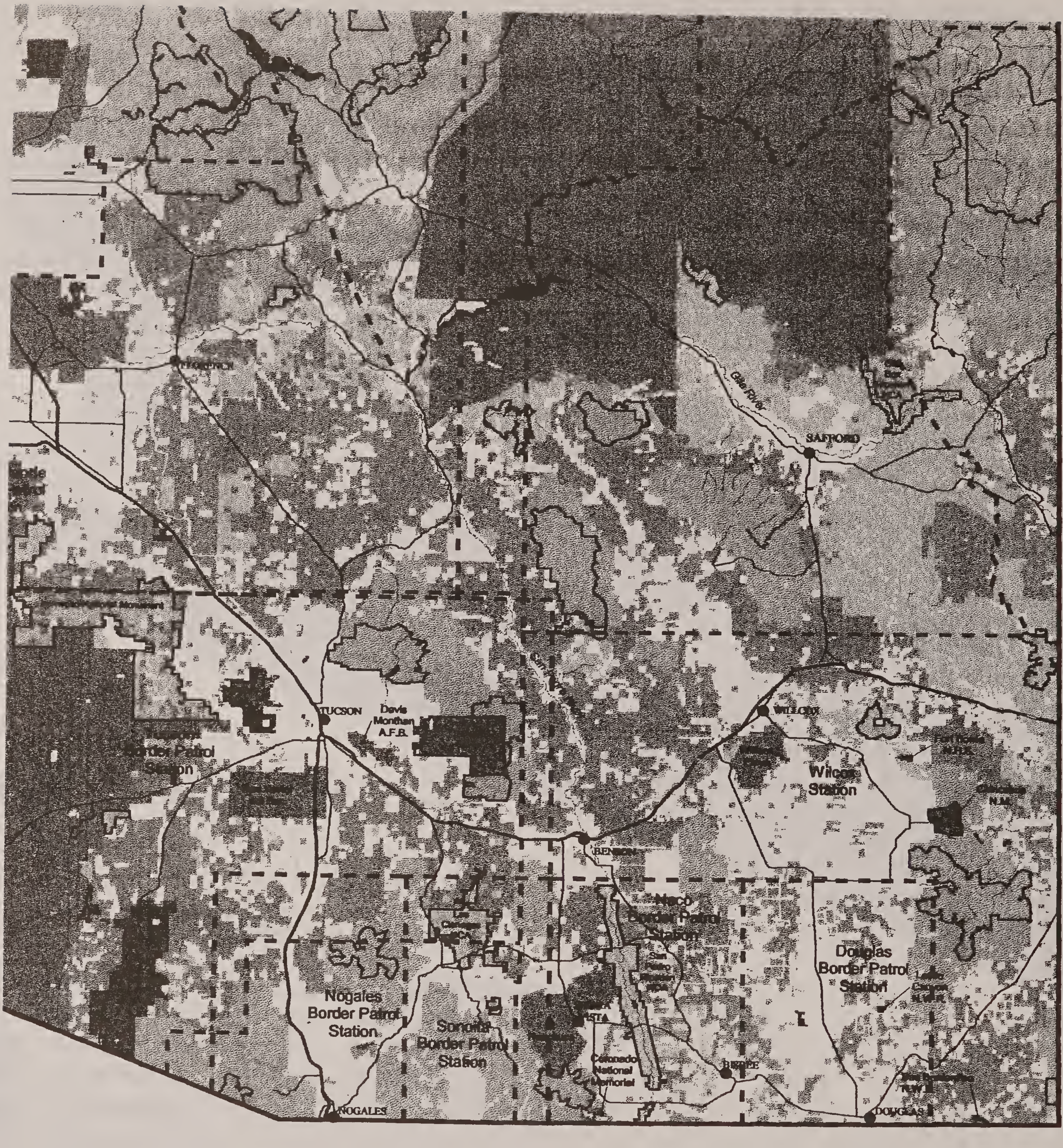
MAP 17

Map 17 is half of a larger map, the other half being shown on Map 18. The main problems here are text size and location. Note the small size of the text for the "Barry M. Goldwater Air Force Range," "Tohonono O'odham Nation," and other similar sized text. There is plenty of room available to make these labels larger, and thus much more readable. The location problem involves city names that are touching or even being partially covered by the city location dots. In this context, note "Phoenix" and "Ajo" touching their dots, while "Yuma" and "Gila Bend" are partially covered by their location dots. This should never happen. There should always be a small space allowed between a name and its respective location dot.

Other concerns:

The label "Sonoran Desert National Monument" should be moved so that it is not obscured by the Interstate highway – and thus is more visible to the map reader.

The legend abbreviations "BLM," "BOR," "F & WS," and "NPS" should be spelled out if there is any chance that the target audience for the map would not be familiar with them.


FLORENCE
Gila River
SAFFORD
TUCSON
Davis Monthan A.F.B.
Tucson Border Patrol Station
WILLCOX
Wilcox Station
Fort Bowie N.H.S.
Chiricahua N.M.
BENSON
Naco Border Patrol Station
San Pedro Riparian NCA
Douglas Border Patrol Station
Nogales Border Patrol Station
Sonoita Border Patrol Station
Coronado National Memorial
SIERRA VISTA
BISBEE
DOUGLAS
NOGALES

UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
ARIZONA STATE OFFICE

No warranty is made by the Bureau of Land Management for use of data for purposes not intended by the BLM

Map produced by the BLM, Arizona State Office Mapping Sciences Group.

100 Miles

160 Kilometers

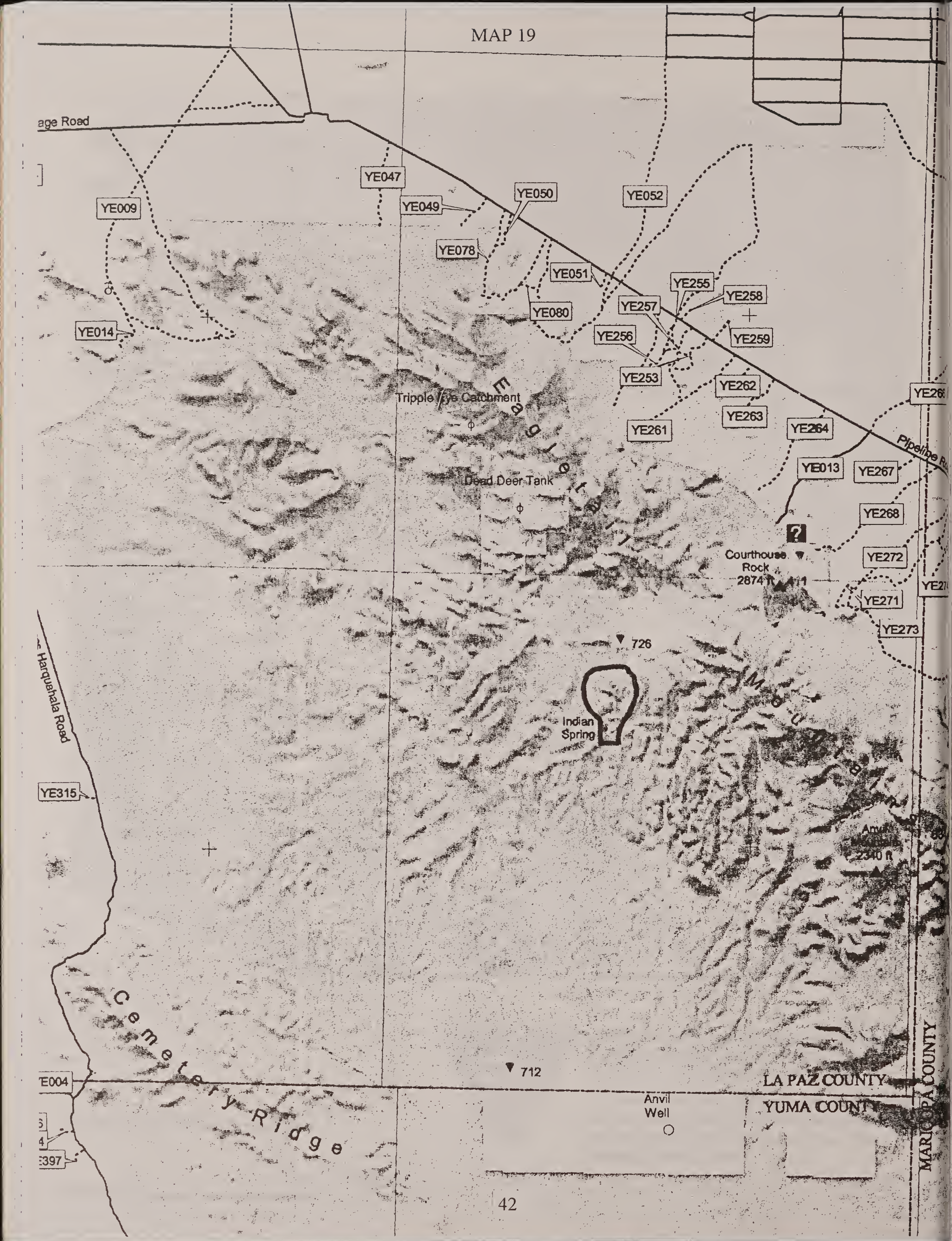
MAP 18

Map 18 is the second half of Map 17, shown on the previous page. There are similar problems with this part. Note that "Tucson" and "Bisbee" are touching their location dots, while the "V" on "Sierra Vista" is actually almost covered by its respective dot. As mentioned earlier, this should never occur. For some better examples of city text and dot spacing, look at "Safford" and "Willcox." There are also some places where the shifting of text – off of lines – would make the labels easier to read. The best example of this is "Ft. Huachuca" where, because of the bold vertical dashed boundary line, the abbreviation "Ft." cannot be seen at all. A common sense rule is that *if you can't read the text, make it larger and/or move it.*

Other concerns:

The organization identification text "United States Department of Interior" should read "United States Department of *the* Interior."

MAP 19


age Road
YE047
YE009
YE049
YE050
YE052
YE078
YE051
YE255
YE258
YE257
YE080
YE014
YE256
YE259
YE253
YE262
Tripple Eye Catchment
Eagletail Mountains
YE26
Pipeline Ro
YE261
YE263
YE264
YE013
YE267
Dead Deer Tank
YE268
Courthouse Rock 2874 ft
YE272
YE27
YE271
YE273
726
Indian Spring
Harquahala Road
YE315
Anvil Mountain 2340 ft
Cemetery Ridge
E004
E397
712
LA PAZ COUNTY
YUMA COUNTY
Anvil Well
MARICOPA COUNTY

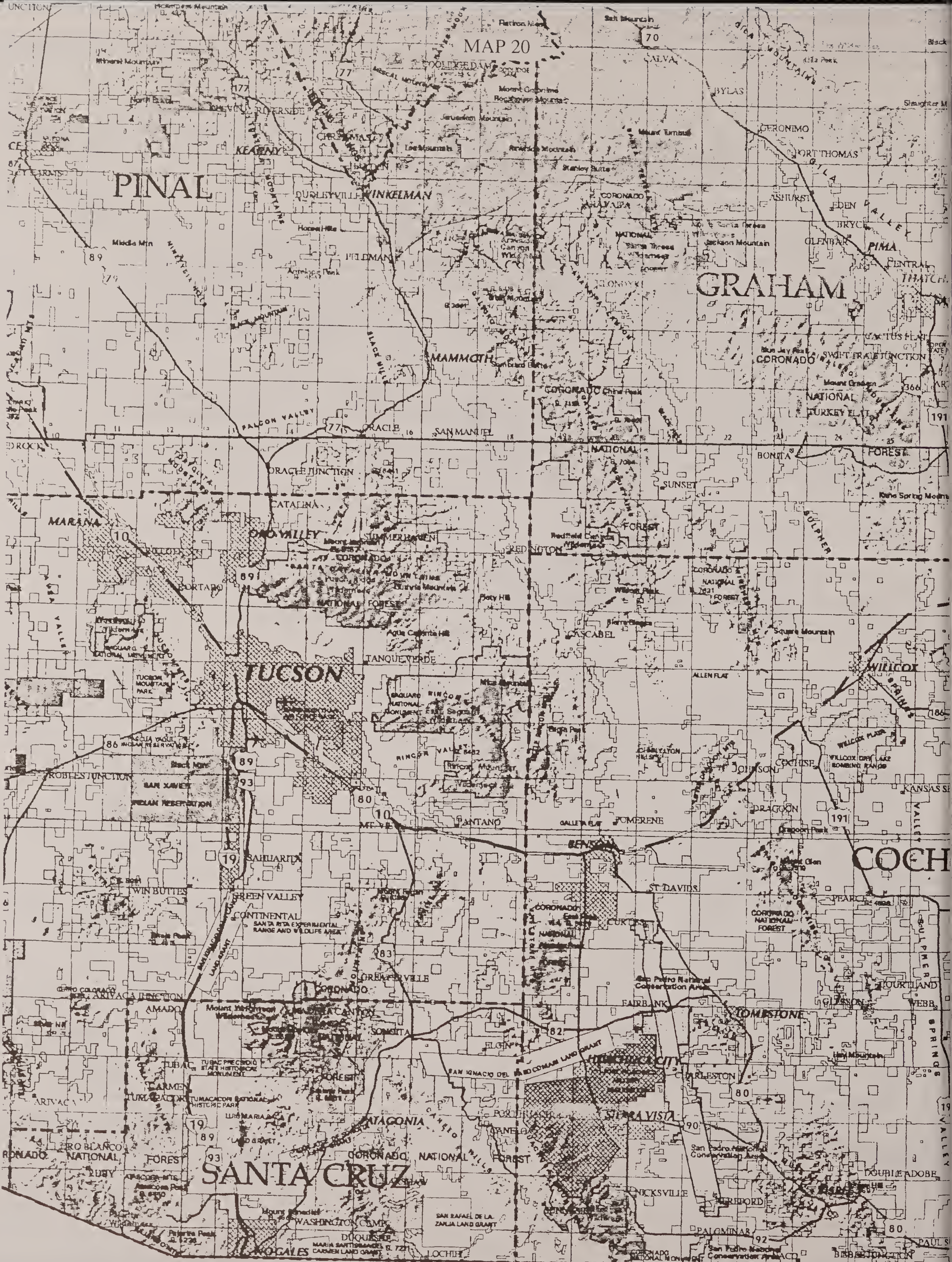
MAP 19

This illustration is part of a larger map. It shows a few feature label situations that could be improved. Note the crossing text "Eagletail" and "Tripple Eye Catchment" near the center of the map. The crossing of lines of text should be avoided whenever possible. In fact, "Tripple Eye Catchment" should be moved anyway. It is too far away from its designating catchment symbol. The same is true of "Dead Dear Tank" and its respective symbol, just below "Tripple Eye Catchment."

An example of good label spacing is represented by "Indian Spring" and the area outline next to it. The use of small triangles to designate the exact locations of mountain peaks is well shown at "Courthouse Rock" and "Anvil Mountain." Also note the curving text lines of "Eagletail Mountains" and "Cemetery Ridge," which are nicely done.

Other concerns:

Some of the road number labels ("YE---") are a little hard to follow. Repositioning a few of these in better locations would be an improvement.


MAP 20
PINAL
GRAHAM
COCH
SANTA CRUZ
TUCSON
KEARNY
WINKELMAN
MAMMOTH
MARANA
ORO VALLEY
BENSON
WILLCOX
TOMBSTONE
SIERRA VISTA
HUACHUCA CITY
PATAGONIA
NOGALES
PIMA
COOLIDGE DAM
CALVA
BYLAS
GERONIMO
FORT THOMAS
ASHURST
EDEN
BRYCE
GLENBAR
CENTRAL
THATCHER
CACTUS FLAT
SWIFT TRAIL JUNCTION
TURKEY FLAT
BONITA
RIVERSIDE
CHRISTMAS
HAYDEN
DUDLEYVILLE
FELDMAN
ORACLE
SAN MANUEL
ORACLE JUNCTION
CATALINA
SUMMERHAVEN
REDINGTON
SUNSET
CORTARO
CASCABEL
TANQUE VERDE
ALLEN FLAT
ROBLES JUNCTION
JOHNSON
COCHISE
DRAGOON
KANSAS SETTLEMENT
PANTANO
POMERENE
SAHUARITA
GREEN VALLEY
CONTINENTAL
ST. DAVIDS
PEARCE
CURTISS
GREATERVILLE
ARIVACA JUNCTION
AMADO
SONOITA
FAIRBANK
GLEESON
COURTLAND
WEBB
ELGIN
CHARLESTON
TUBAC
CARMEN
TUMACACORI
ARIVACA
CANELO
HEREFORD
NICKSVILLE
PALOMINAS
DUQUESNE
WASHINGTON CAMP
LOCHIEL
DOUBLE ADOBE
PAUL SPUR
CORONADO NATIONAL FOREST
GILA VALLEY
GILA MOUNTAINS
SULPHUR SPRINGS VALLEY
SAN PEDRO RIVER
SAN XAVIER INDIAN RESERVATION
SAGUARO NATIONAL MONUMENT
TUCSON MOUNTAIN PARK
SANTA RITA EXPERIMENTAL RANGE AND WILDLIFE AREA
SAN RAFAEL DE LA ZANJA LAND GRANT
SAN IGNACIO DEL BABOCOMARI LAND GRANT
San Pedro Riparian National Conservation Area
WILLCOX DRY LAKE BOMBING RANGE
TUBAC PRESIDIO STATE HISTORIC PARK
TUMACACORI NATIONAL HISTORIC PARK
Mount Graham
Mount Lemmon
Mount Wrightson
Mount Turnbull
Jackson Mountain
Dragoon Peak
Square Mountain
10
19
70
77
80
82
83
86
89
90
92
93
177
186
191
366

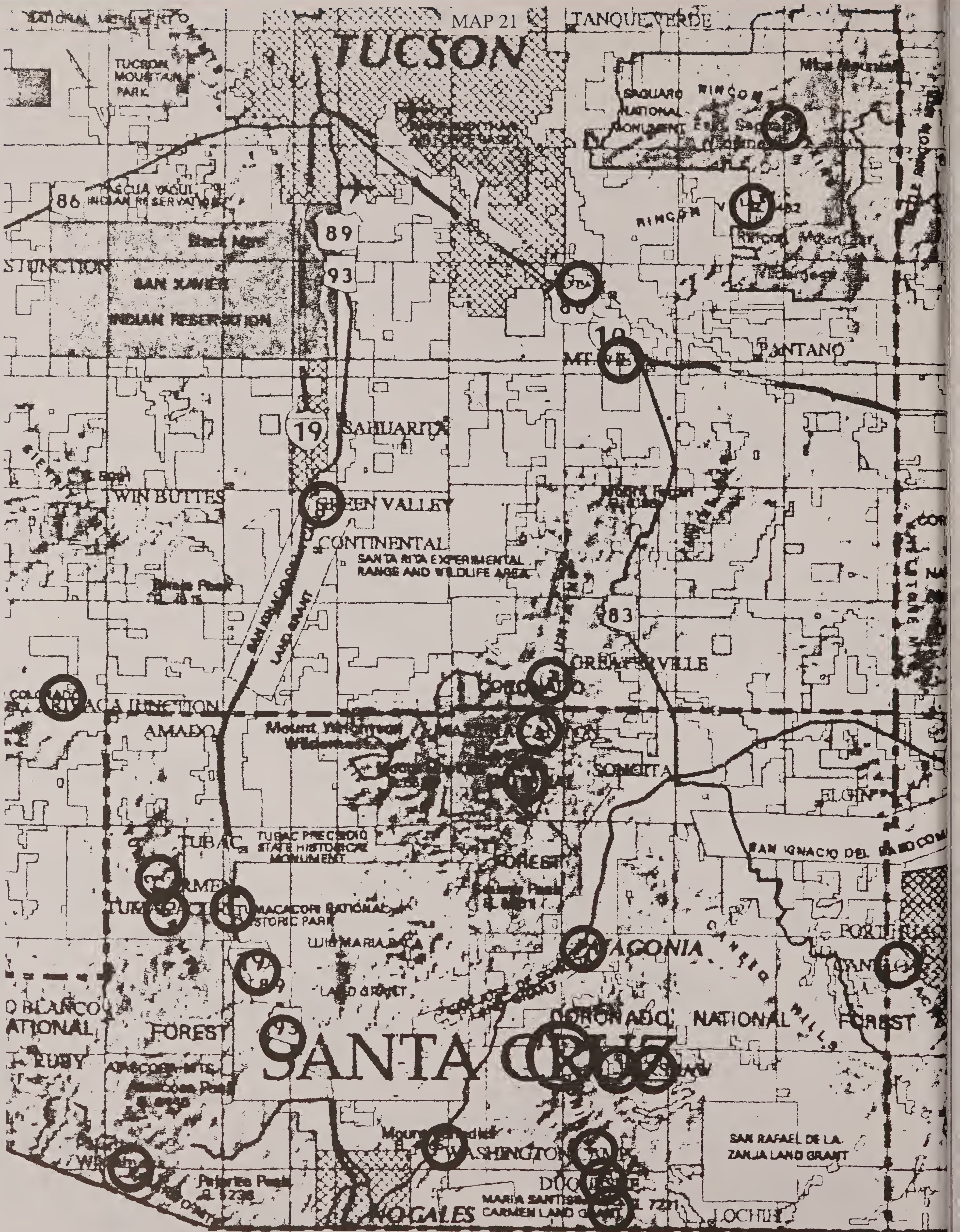
MAP 20

This is part of a larger color map, shown at 100% of original size. A number of problems are readily apparent. Some of the text is too small to read. Many of the labels are incorrectly italicized (italics is reserved for *hydrographic* features). The word "county" should be added to the county names. And, there are numerous cases of text overlapping other text. (See Map 21 for a more specific look at this particular problem.)

In general, this map tends to fail part of "The Golden Rule of Cartography:" *A Map must be Readable, Understandable, and Accurate.* Because some of the text is too small and congested to see, part of it is not "readable." Since we can't read those parts, they are not "understandable." They may be "accurate" but since we can't see them, they do us no good. The map consequently needs to be redone into a less complex, more user-friendly format.

The original map, in its entirety, was reviewed and edited by the author. This edit is presented in Appendix II. Please refer to this Appendix for a detailed analysis of the cartographic problems associated with this type of map, and some general conclusions and suggestions for remedying these problems. (Appendix II also includes an annotated overlay displaying the "edit markup" of the area shown in Map 20.)

MAP 21



NATIONAL MONUMENT
TANQUE VERDE
TUCSON
TUCSON MOUNTAIN PARK
SAGUARO NATIONAL MONUMENT
RINCON
PASCUA YAQUI INDIAN RESERVATION
86
89
93
RINCON VALLEY
Rincon Mountains
SAN XAVIER INDIAN RESERVATION
10
PANTANO
19
SAHUARITA
TWIN BUTTES
GREEN VALLEY
CONTINENTAL
SANTA RITA EXPERIMENTAL RANGE AND WILDLIFE AREA
SAN IGNACIO LAND GRANT
83
GREATERVILLE
CORONADO
ARIVACA JUNCTION
AMADO
Mount Wrightson Wilderness
SONOITA
ELGIN
TUBAC
TUBAC PRESIDIO STATE HISTORIC MONUMENT
TUMACACORI
TUMACACORI NATIONAL HISTORIC PARK
FOREST
LUIS MARIA BACA LAND GRANT
PATAGONIA
CANELO HILLS
SAN IGNACIO DEL BABOCOMARI
CORONADO NATIONAL FOREST
ORO BLANCO
NATIONAL FOREST
RUBY
ATASCOSA MTS.
SANTA CRUZ
SAN RAFAEL DE LA ZANJA LAND GRANT
WASHINGTON CAMP
DUQUESNE
MARIA SANTISIMA DEL CARMEN LAND GRANT
NOGALES
LOCHIEL

MAP 21

Map 21 is a 200% blowup of part of Map 20. Because of the excessive amount of enlargement, this illustration is quite hard to see. However it does adequately display the problem of text overlap. These are marked on the map to make them easily visible. There are at least two dozen locations on this small map segment where overlapping text or text-containing symbols occur. As you can imagine, on the original large map (containing the rest of the state) there were many, many other cases where text overlap took place.

This sample demonstrates an inherent problem in computer mapping. When various layers are added to a map, text overlap can easily happen. Prior planning on the layering can help but a detailed edit (or better yet, two or three reviews at various times in the process) is absolutely necessary to ferret out and correct these overlap problems.*

See Appendix II for an example of a detailed edit of the full state map. Also shown is an annotated review overlay of the part of the map shown here.

---

* The *Map Editing Guide* provides material on editing technique. See the Bibliography for information on this document.

MAP 22

Legend

☐ **Bureau of Land Management**

░ **Bill Williams River National Wildlife Refuge**

▓ **Colorado River Indian Reservation**

▓ **Army Corps of Engineers**

☐ **Private**

▓ **La Paz County Park**

☐ **AZ State Trust Land**

▓ **AZ State Parks Buckskin Mountain**

Roads and Trails

╱╲╱ High Clearance or 4 Wheel Drive Routes

╱╲╱ County Maintained Roads

╱╲╱ Highways

🔑 Locked Gate

Special Management Areas

▒ **OHV Open Areas**

▨ **Swansea Townsite**

▓ **Wilderness**

MAP 22

When placing text and pattern boxes in the legend it is important to keep them straight (parallel) and separated by equal spacing. This may be considered part of the "science" of text placement. Note the boxes in this illustration (taken from a large map). They appear to move back and forth as you view them from top to bottom. This is because they are not parallel in a vertical direction. Accuracy in the placement and spacing of map elements is an important part in the construction of any map.

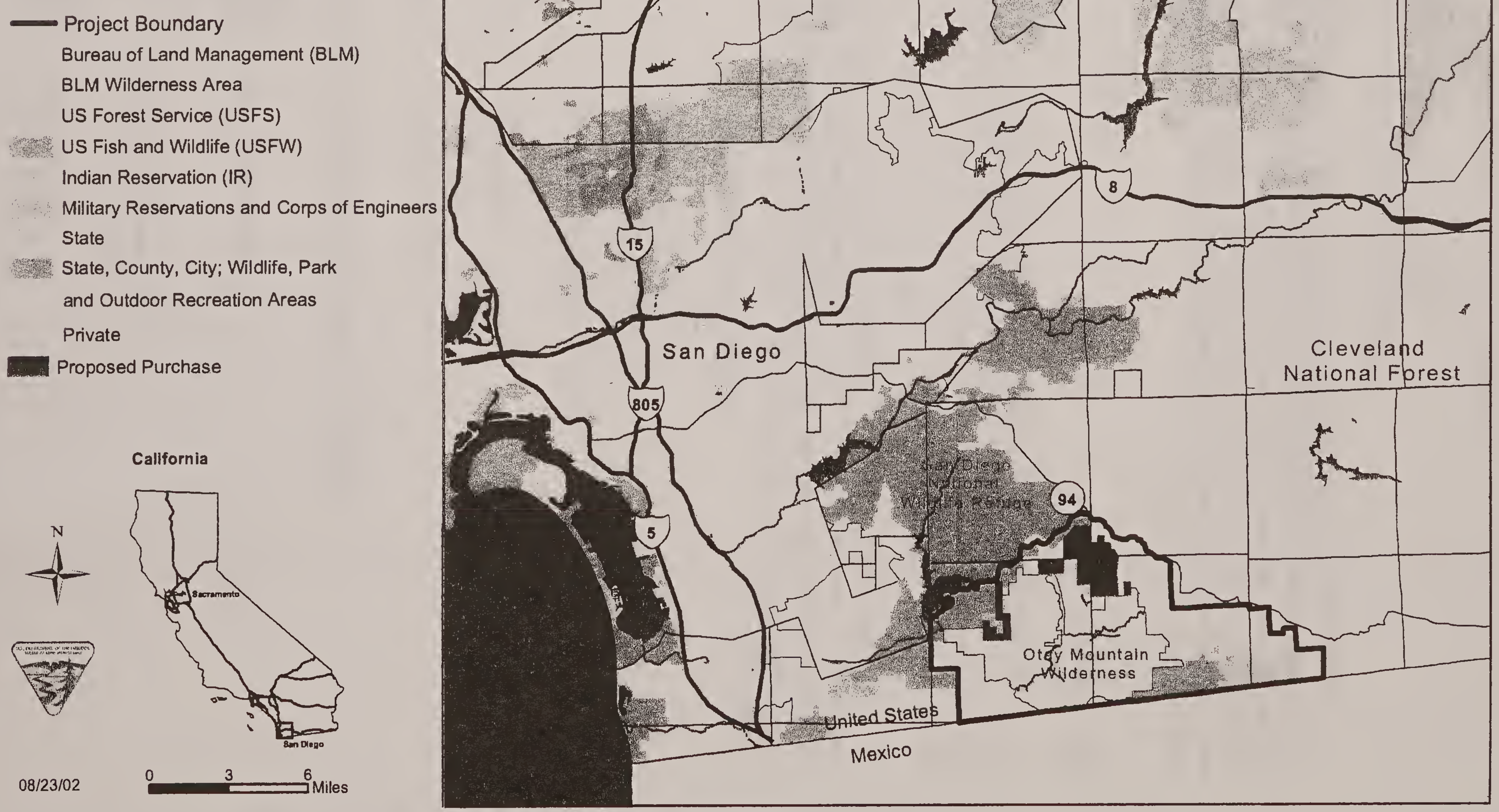
Other concerns:

The lines denoting the "High Clearance or 4 Wheel Drive Routes," "County Maintained Roads," and "Highways" should not be shown in a *zigzag* form. (This indicates to the reader that he/she will actually see this pattern – the zigzag – on the map!) Straight lines should be used instead.

The text "Roads and Trails" and "Special Management Areas" should be slightly smaller in size than the text for "Legend." This is because they are *subheadings* of the legend – actually a *part* of the legend, not separate entities of equal importance. Another subheading entitled "Land Status" should be added underneath "Legend" to describe what these pattern boxes actually designate.

Otay Mountain/ Kuchamaa Habitat Conservation Plan

Map 1 of 2



Project Boundary
Bureau of Land Management (BLM)
BLM Wilderness Area
US Forest Service (USFS)
▨ US Fish and Wildlife (USFW)
Indian Reservation (IR)
▨ Military Reservations and Corps of Engineers
State
▨ State, County, City; Wildlife, Park and Outdoor Recreation Areas
Private
■ Proposed Purchase
California
Sacramento
San Diego
N
08/23/02
0
3
6
Miles
15
805
5
8
94
San Diego
Cleveland National Forest
San Diego National Wildlife Refuge
Otay Mountain Wilderness
United States
Mexico

MAP 23

The proper placement of highway number shields is important to the understanding of a map. As an example, look at the location of the shield for the 805 freeway as depicted here. It has been placed right *on* the intersection of two major north-south interstates, so it is confusing – at first glance – how these roads interact and then continue to the south. The highways (I-805 and I-15) should be labeled both north and south of their intersection.

The Interstate 8 shield could be moved about half-an-inch to the right so it is located on a (visually superior) horizontal segment of the highway. (Always center the shield number within the shield, and the shield location on the highway, as accurately as possible.) The route 94 symbol could be moved approximately one-quarter of an inch to the upper left, so that it does not touch the "Otay Mountain Wilderness" boundary and thus better depicts the road location.

Other concerns:

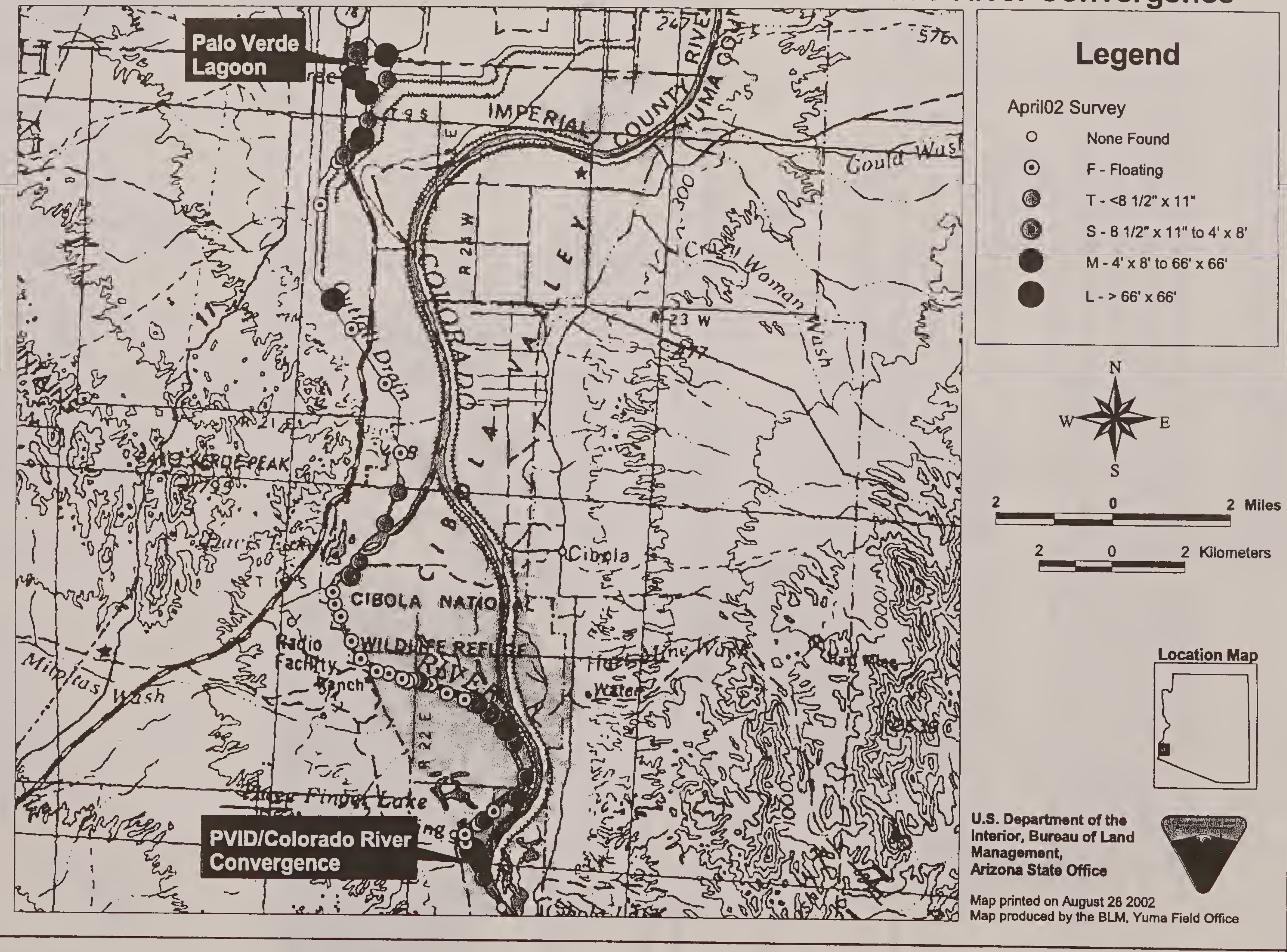
The "California" location diagram is poor because it is too complex and doesn't show the actual location well. Just a state outline, a dot for "San Diego," and a box for the position of the map would be much more effective.

The scale is sited too close to the location diagram. At first glance one might think that it applies to this diagram and not the main map.

The north arrow could be better centered over the BLM logo. "Pacific Ocean" should be in italic text (it is a hydrographic feature).

MAP 24

April 2002 Salvinia Molesta Survey Results - Palo Verde Lagoon to PVID/ Colorado River Convergence


Palo Verde Lagoon
PVID/Colorado River Convergence
IMPERIAL
COUNTY
YUMA COUNTY
RIVER
COLORADO
CIBOLA
CIBOLA NATIONAL WILDLIFE REFUGE
Cibola
Radio Facility
Ranch
Gould Wash
Crazy Woman Wash
Hart Mine Wash
Milpitas Wash
PALO VERDE PEAK
Three Finger Lake
R 23 W
R 22 E
78
95
247
576
Legend
April02 Survey
○ None Found
⊙ F - Floating
● T - <8 1/2" x 11"
● S - 8 1/2" x 11" to 4' x 8'
● M - 4' x 8' to 66' x 66'
● L - > 66' x 66'
N
W
E
S
2 0 2 Miles
2 0 2 Kilometers
Location Map

U.S. Department of the Interior, Bureau of Land Management, Arizona State Office

Map printed on August 28 2002
Map produced by the BLM, Yuma Field Office

MAP 24

This is a reproduction of a color map at 75% of original size. It has a number of problems, including the following:

The text is hard to read, even at the colored original larger size. It has been overly "pixelized" by the digital process.

In a number of places symbols or other lines obscure the text.

If you look around the edge of the map, you will note that the text is cut off (runs off the map border) in at least 10 places.

The topographic contour lines are not labeled and the contour interval is not given. (Elevation contours may not have been needed on this map. If omitted this would have simplified the map and made it much easier to read.)

Better planning and the selection of a more appropriate map base would have improved this map considerably.

Other concerns:

There should be a space between "April" and "02" in the legend and, in fact, it should read "April 2002."

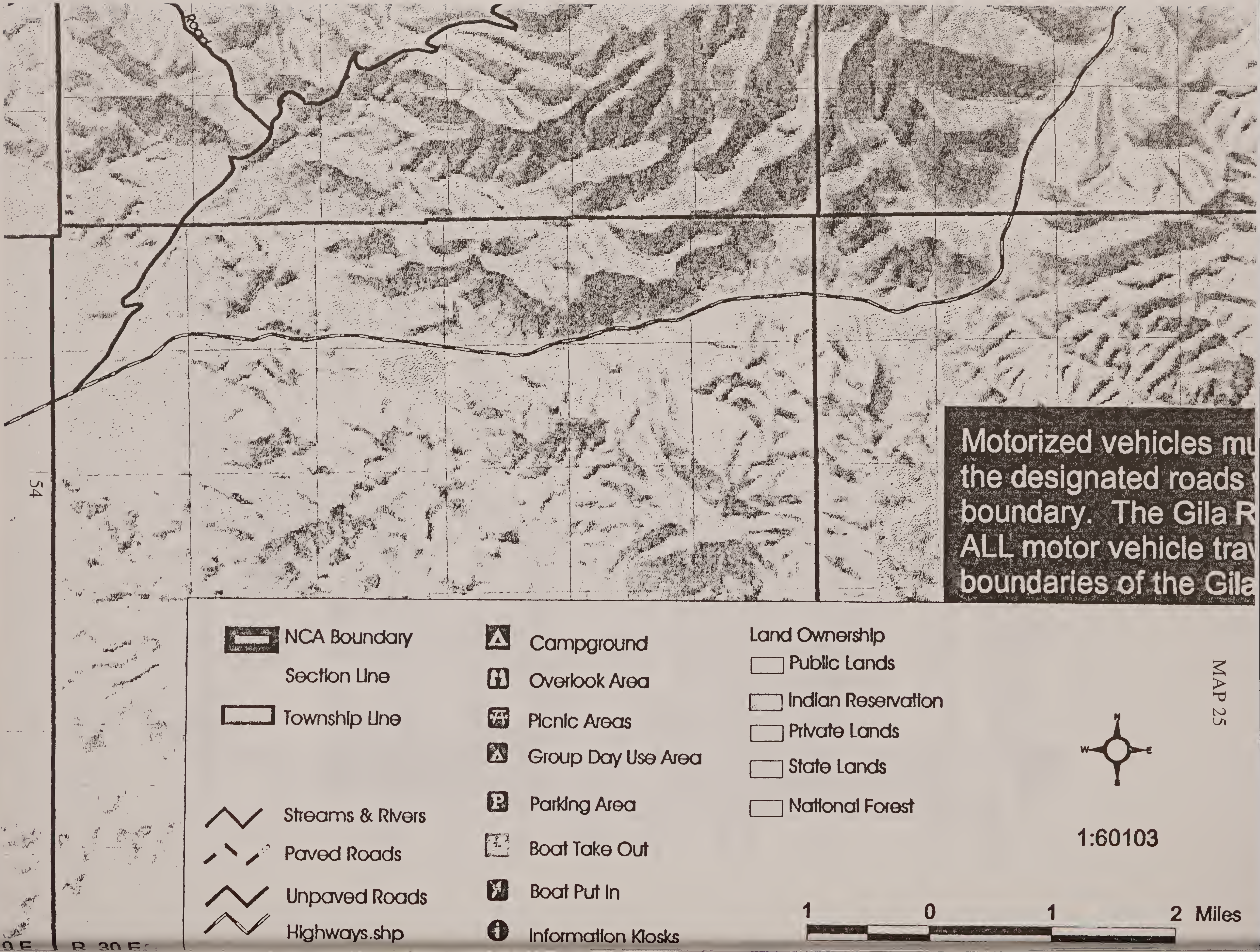
In the compass rose the "W" and "E" are not centered on the compass (they're slightly low).

The "Location Map" should be centered in the legend area (moved to the left), "Yuma" should be added, and "Phoenix" could be added as well.

The organization information should read in contiguous lines as follows:

U.S. Department of the Interior
Bureau of Land Management
Arizona State Office

(Adjust the text size or logo location to make it fit properly.)


Road
NCA Boundary
Section Line
Township Line
Streams & Rivers
Paved Roads
Unpaved Roads
Highways.shp
Campground
Overlook Area
Picnic Areas
Group Day Use Area
Parking Area
Boat Take Out
Boat Put In
Information Kiosks
Land Ownership
Public Lands
Indian Reservation
Private Lands
State Lands
National Forest
N
W
E
S
1:60103
1
0
1
2 Miles
9 E
R. 30 E

Motorized vehicles mu
the designated roads
boundary. The Gila R
ALL motor vehicle tra
boundaries of the Gila

MAP 25

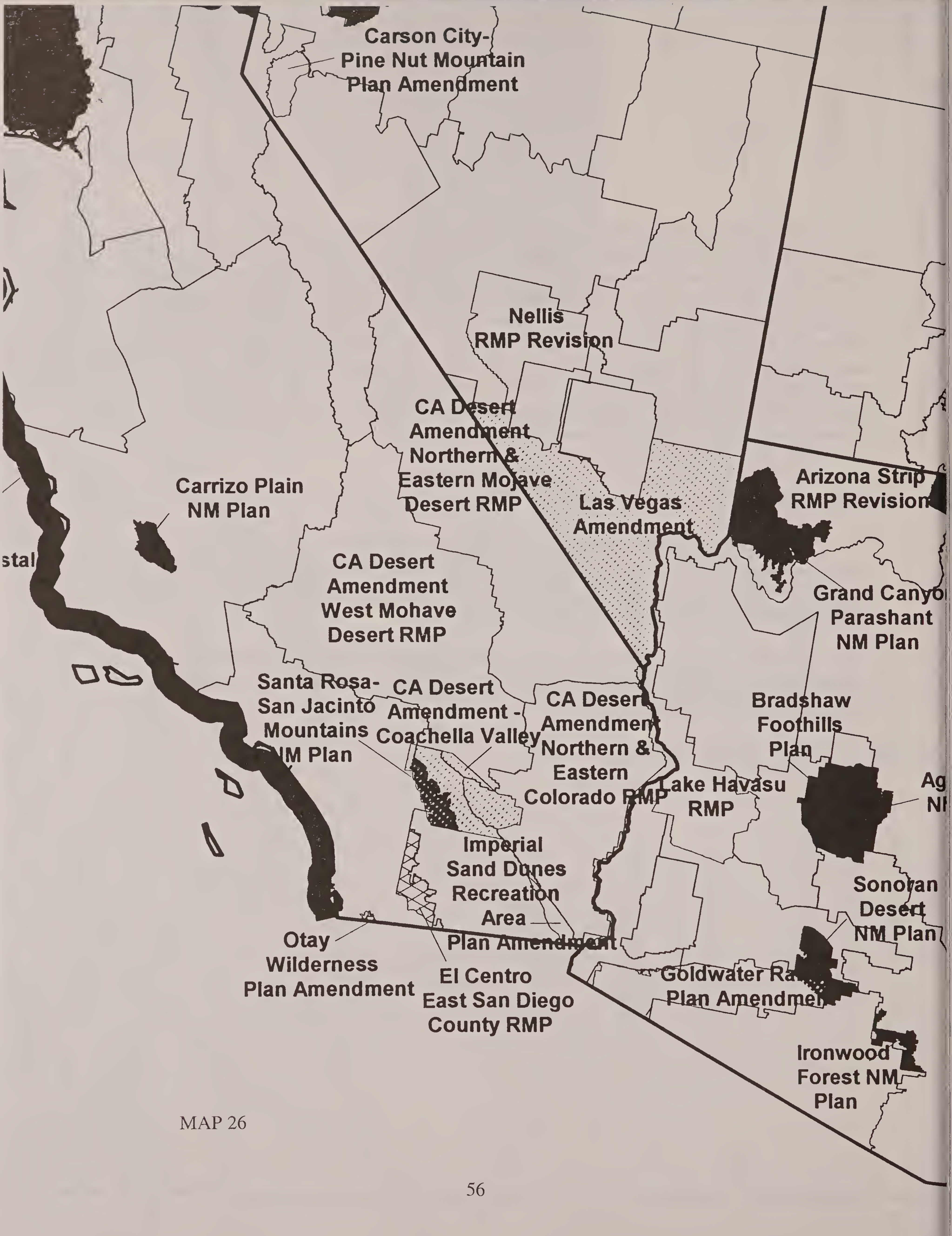
MAP 25

This is part of a legend on a large map. It contains a number of common problems which should be rectified. First, the spacing between some of the recreation symbols and the "Land Ownership" boxes is not consistent. Also, the Land Ownership boxes are not accurately aligned in a vertical direction. Second, the "Section Line" and "Township Line" are shown as boxes. They should be depicted as lines – they are *linear* not *area* features. Third, the lines for "Streams & Rivers," "Paved Roads," "Unpaved Roads," and "Highways" should be *straight* lines, not zigzagged. (And what is the "Highways.shp?" Obviously it's a typographical error that should have been caught during the map review.) Finally, the "N," "S," "E," "W" on the compass rose are too close. They are touching the compass (there should be a little space allowed) and the "N" is off-center to the left.

Other concerns:

The proportional scale "1:60103" makes little sense, even to a professional cartographer. The map should be produced at the rectified scale of 1:60,000. Better yet, the proportional scale could be omitted entirely to let the bar scale provide the required information (which is a much more informative method for the average map user).

The term "Land Ownership" should probably be replaced with "Land Status." Ownership implies *possession* of the land when, in fact, it is being *managed for* the American public by BLM and other federal (and state) agencies.


Carson City-Pine Nut Mountain Plan Amendment
Nellis RMP Revision
CA Desert Amendment Northern & Eastern Mojave Desert RMP
Las Vegas Amendment
Arizona Strip RMP Revision
Carrizo Plain NM Plan
stal
Grand Canyo
Parashant NM Plan
CA Desert Amendment West Mohave Desert RMP
Santa Rosa-San Jacinto Mountains NM Plan
CA Desert Amendment - Coachella Valley
CA Desert Amendment Northern & Eastern Colorado RMP
Bradshaw Foothills Plan
Lake Havasu RMP
Ag
NI
Imperial Sand Dunes Recreation Area Plan Amendment
Sonoran Desert NM Plan
Otay Wilderness Plan Amendment
El Centro East San Diego County RMP
Goldwater Ra
Plan Amendme
Ironwood Forest NM Plan

MAP 26

MAP 26

The siting of descriptive text in the best possible location – for legibility reasons – should be a major goal for any cartographer. On this map there are a number of places where the text is hard to read because it is obscured by boundary lines or other information. For example, the "Santa Rosa-San Jacinto Mountains NM Plan" has the "N" covered by the coastal data. The "CA Desert Amendment Northern & Eastern Mojave Desert RMP" is split by the California-Nevada boundary line. Letters in the "CA Desert Amendment Northern & Eastern Colorado RMP" are covered by the California-Arizona boundary line. (There is also an overlap of this text with "Lake Havasu RMP.") "Imperial Sand Dunes Recreation Area Plan Amendment" has the word "Amendment" covered by the international boundary.

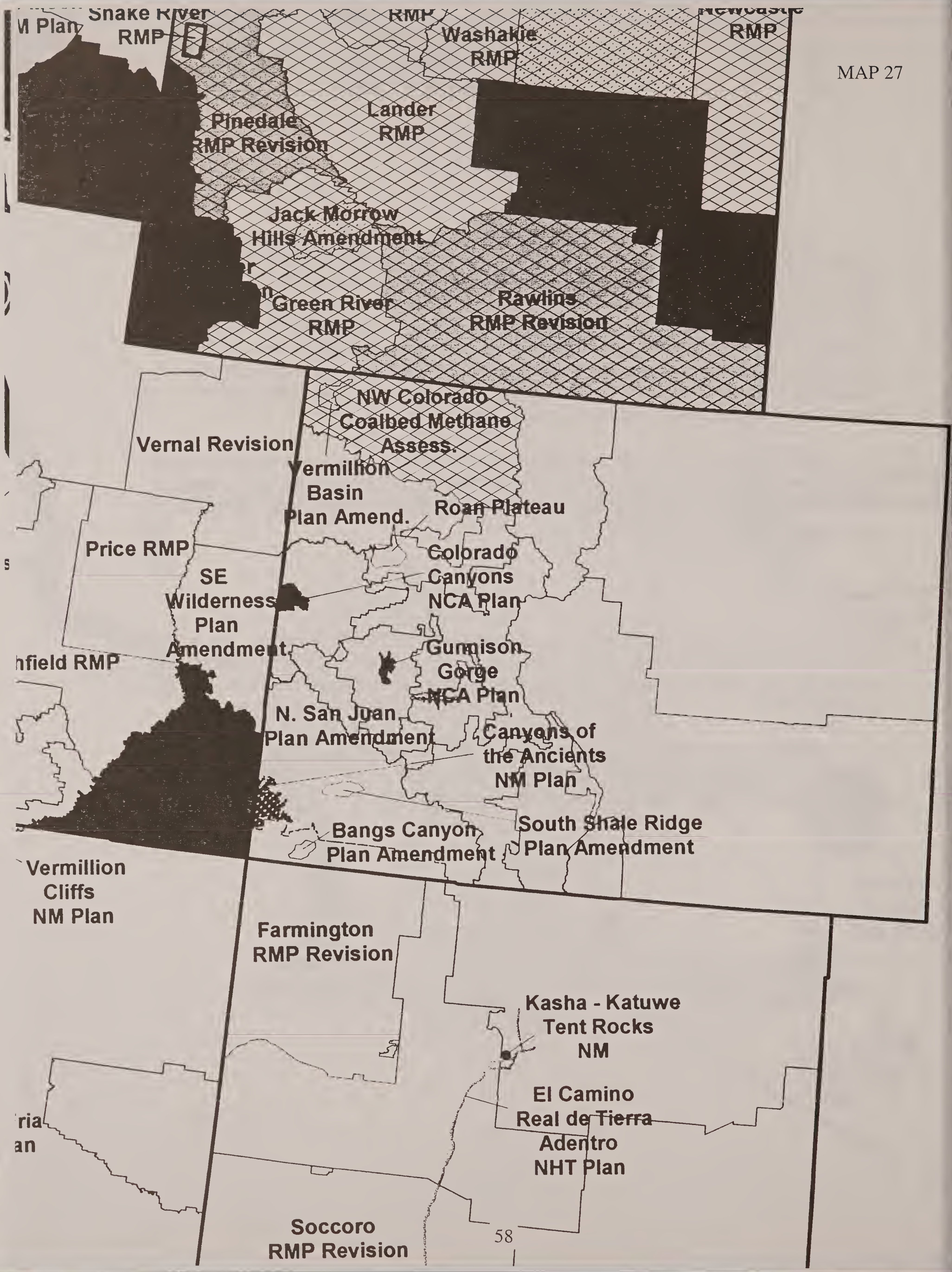
The solution to this type of problem is to shift the text – as much as possible – into open spaces where there are no conflicting lines or other data. As an example, the "Santa Rosa-San Jacinto Mountains NM Plan" could be shifted into the Pacific Ocean area, where there is ample room.

Other concerns:

Some of the leder lines on this map could be improved. The leder line for "Carrizo Plain NM Plan" is located too far from the text. The line for "Grand Canyon Parashant NM Plan" touches the text, while the one for "Ironwood Forest NM Plan" extends through part of the wording.

The map might also be improved if the text ran *with* the latitude lines (even though they aren't shown directly). This would require reorienting the map so north is exactly straight up (not at an angle, as it is now) which is probably a good idea anyway.

MAP 27


M Plan
Snake River RMP
RMP
Washakie RMP
Newcastle RMP
Pinedale RMP Revision
Lander RMP
Jack Morrow Hills Amendment
Green River RMP
Rawlins RMP Revision
NW Colorado Coalbed Methane Assess.
Vernal Revision
Vermillion Basin Plan Amend.
Roan Plateau
Price RMP
Colorado Canyons NCA Plan
SE Wilderness Plan Amendment
hfield RMP
Gunnison Gorge NCA Plan
N. San Juan Plan Amendment
Canyons of the Ancients NM Plan
Bangs Canyon Plan Amendment
South Shale Ridge Plan Amendment
Vermillion Cliffs NM Plan
Farmington RMP Revision
Kasha - Katuwe Tent Rocks NM
El Camino Real de Tierra Adentro NHT Plan
ria an
Soccoro RMP Revision

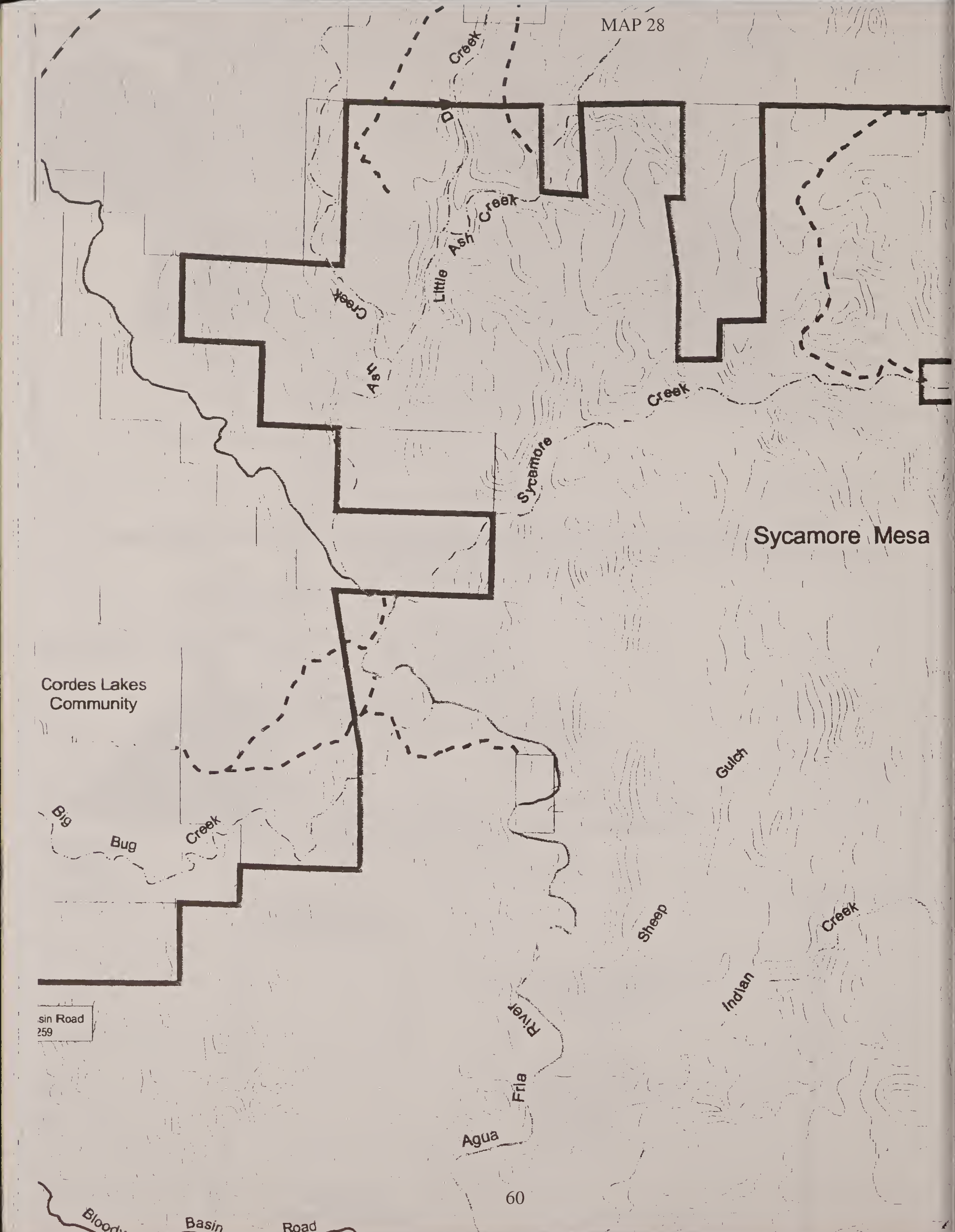
MAP 27

As with Map 26, this map has a problem with text that is being obscured by line boundaries. This is particularly evident in the complex label and boundary area of west-central Colorado. One possible solution would be to place the labels farther east, in the less cluttered area of Colorado (with correspondingly longer leder lines required). Another -- and probably better -- solution would be to create a slight white or "ghost" space around the text letters, so they would stand out more prominently from the background lines (see Appendix IV). This technique would also aid the readability of the labels in the crosshatched areas of Wyoming. (Note that this map, as with the previous Map 26, was originally a color map. Consequently the areas that appear "black" in this reproduction were actually more visible, and thus somewhat easier to read.)

Other concerns:

This map should also be reoriented so that north is perpendicular to the page (ie, straight up); then the labels could be positioned to "flow" with the latitude arcs.

MAP 28


Creek
D
Little Ash Creek
Ash Creek
Sycamore Creek
Sycamore Mesa
Cordes Lakes Community
Big Bug Creek
Sheep Gulch
Indian Creek
Agua Fria River
sin Road
259
Bloody Basin Road

MAP 28

Map 28 is part of a larger map, shown at its original size. It has been printed "light" so that the contour lines have almost faded away, thus allowing the text to be more easily seen. The major problem here is the orientation of the text for the various creeks. Looking from top to bottom, the word "Dry" in "Dry Creek" is obscured by a bold boundary line. It should be moved. "Little Ash Creek" has the "k" touching the stream; this text also needs to be smoothed. "Ash Creek" is upside-down! "Sycamore Creek" should be smoothed. "Indian Creek" could be smoothed a bit too, and the tilting "i" corrected. Finally, part of the "Agua Fria River" is upside-down.

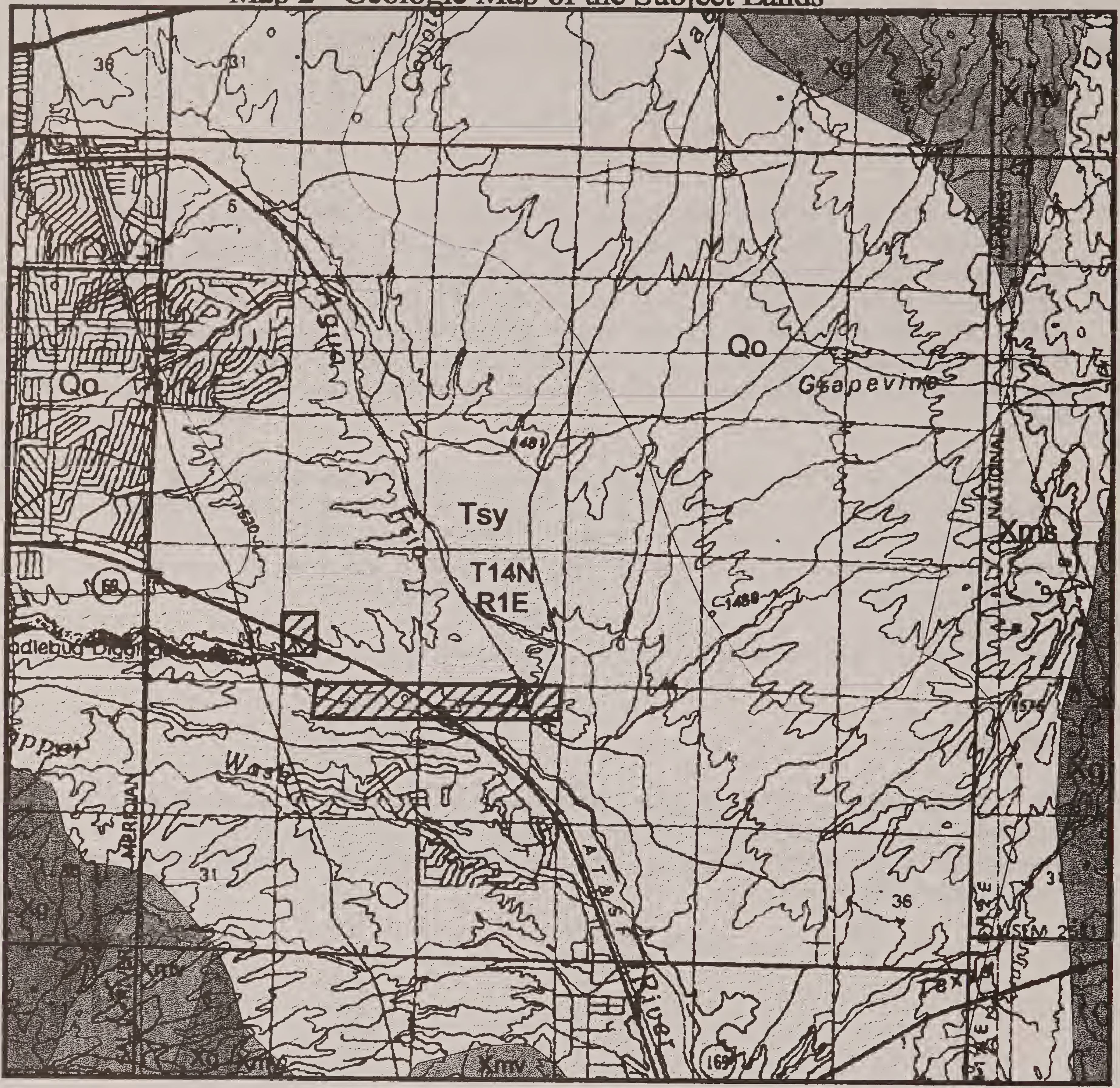
When labeling a fluvial feature (creek, stream, river, etc.) it is not necessary – or desirable – to follow every twist and bend that the feature makes. A more gradual curve that generally mirrors the trace of the flow is adequate. Also, the text should not be placed upside-down if at all possible (and there is invariably space somewhere along the stream to enable it to be placed right-side-up).

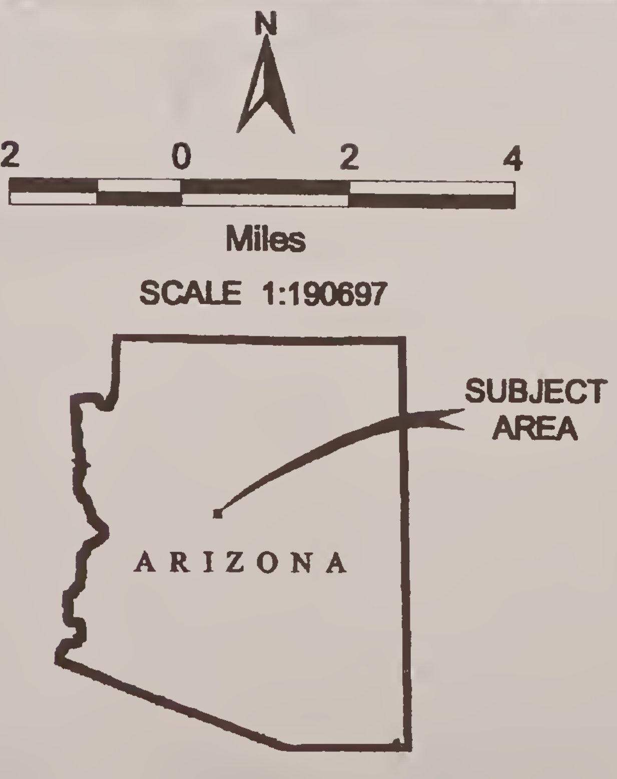
For an example of how the labels on this map could be improved, see Appendix III.

Other concerns:

As mentioned before, cartographic convention states that fluvial features should be set in italic type. Thus, all the creeks and the river on this map should be changed to italics. Note however that "Sheep Gulch" is OK as it is, since it is a "land" feature (even though it may have water flowing in it at times).

Map 2 - Geologic Map of the Subject Lands


Xg
Xmv
Qo
Qo
Grapevine
Tsy
T14N
R1E
Xms
Xg
Xmv
Xg
Xmv
Xmv
Xg
River
NATIONAL
36
31
31
36


N
2
0
2
4
Miles
SCALE 1:190697
SUBJECT AREA
ARIZONA

EXPLANATION

MAP UNITS

Qo	Older surficial deposits (middle Pleistocene to latest Pliocene) Alluvium with less abundant talus and eolian deposits
Tsy	Sedimentary rocks (Pliocene to Middle Miocene) - Units deposited during and after late Tertiary normal faulting, sedimentary parts of the Bidahochi Formation and the Bouse Formation; commonly capped by patches of Quaternary surficial deposits
Xg	Granitoid rocks (Early proterozoic; 1650 to 1750 Ma)—Granite, granodiorite, tonalite, quartz diorite, diorite, and gabbro
Xms	Metasedimentary rocks (Early Proterozoic; 1650 to 1800 Ma)
Xmv	Metavolcanic rocks (Early Proterozoic; 1650 to 1800 Ma)
▨	SUBJECT LANDS

MAP 29

This is a reproduction of a color map. The original is slightly easier to read, but a better (less complex) base map should have been selected to portray the geologic data. Note that some of the text and lines are pixelized and that several words are cut off at the map edge. Contour lines are shown but they are hard to follow. We don't know what the contour interval is, or even if the few contour numbers provided are in English or metric units. Basically, this is just a hard to read map.

In the "Explanation" (which traditionally would be called the "Legend") the text for the "Map Units" is quite small. By adjusting the location of the map unit designation boxes to eliminate empty space (especially in the second column) this text could be made slightly larger – which would aid in readability. At the time this is done, the misaligned text in the "Qo" geologic block can be fixed.

Other concerns:

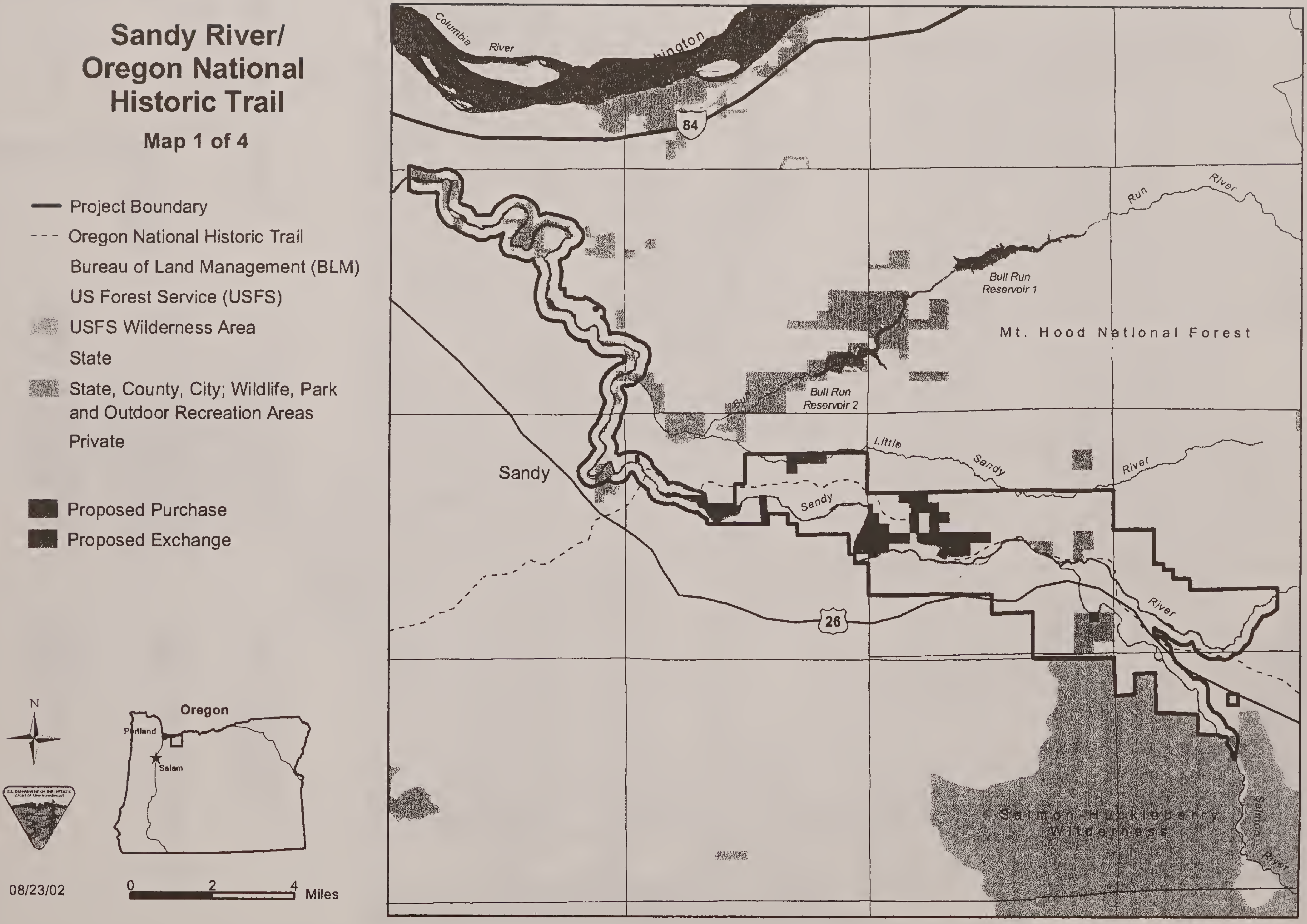
Note that the map is slightly crooked so north is not exactly straight up, as the north arrow incorrectly shows.

The indicated scale of 1:190697 implies an accuracy which has little meaning. The map should be replotted at 1:190,000 or this number should be dropped entirely. (The scale bar does a much better job of showing distance, for the average reader.)

The location map should have "Phoenix" added in order to aid in the comprehension of where the "Subject Area" is actually located. As it stands now, this area is sited somewhere in the middle of the blank state of Arizona.

Sandy River/ Oregon National Historic Trail

Map 1 of 4



Project Boundary
Oregon National Historic Trail
Bureau of Land Management (BLM)
US Forest Service (USFS)
USFS Wilderness Area
State
State, County, City; Wildlife, Park and Outdoor Recreation Areas
Private
Proposed Purchase
Proposed Exchange
N
Oregon
Portland
Salem
08/23/02
0
2
4
Miles
Columbia River
Washington
84
Bull Run River
Bull Run Reservoir 1
Bull Run Reservoir 2
Mt. Hood National Forest
Little Sandy River
Sandy
Sandy River
26
Salmon-Huckleberry Wilderness
Salmon River

MAP 30

Map 30 has some river names that could have been better placed. Note that the labels for "Bull Run River" are separated by over half of the map width, between "Bull" and "Run." This is too great a distance to require the reader to search for the various parts of the label. On a "busy" map it would be especially difficult. If a river, stream, etc. extends for a lengthy distance, it should be labeled twice. Also, for better visual balance it is desirable to *evenly* space the text – as much as possible. In this case for example, there should be a similar amount of distance between "Bull," "Run," and "River."

"Sandy River" has the same problem; the labels are spread too far apart. However "Little Sandy River" is a better spacing example. The labels are closer together and (approximately) evenly spaced between the words. Consequently the map viewer doesn't have to search across the page to find the various parts of the text and it is much easier to read.

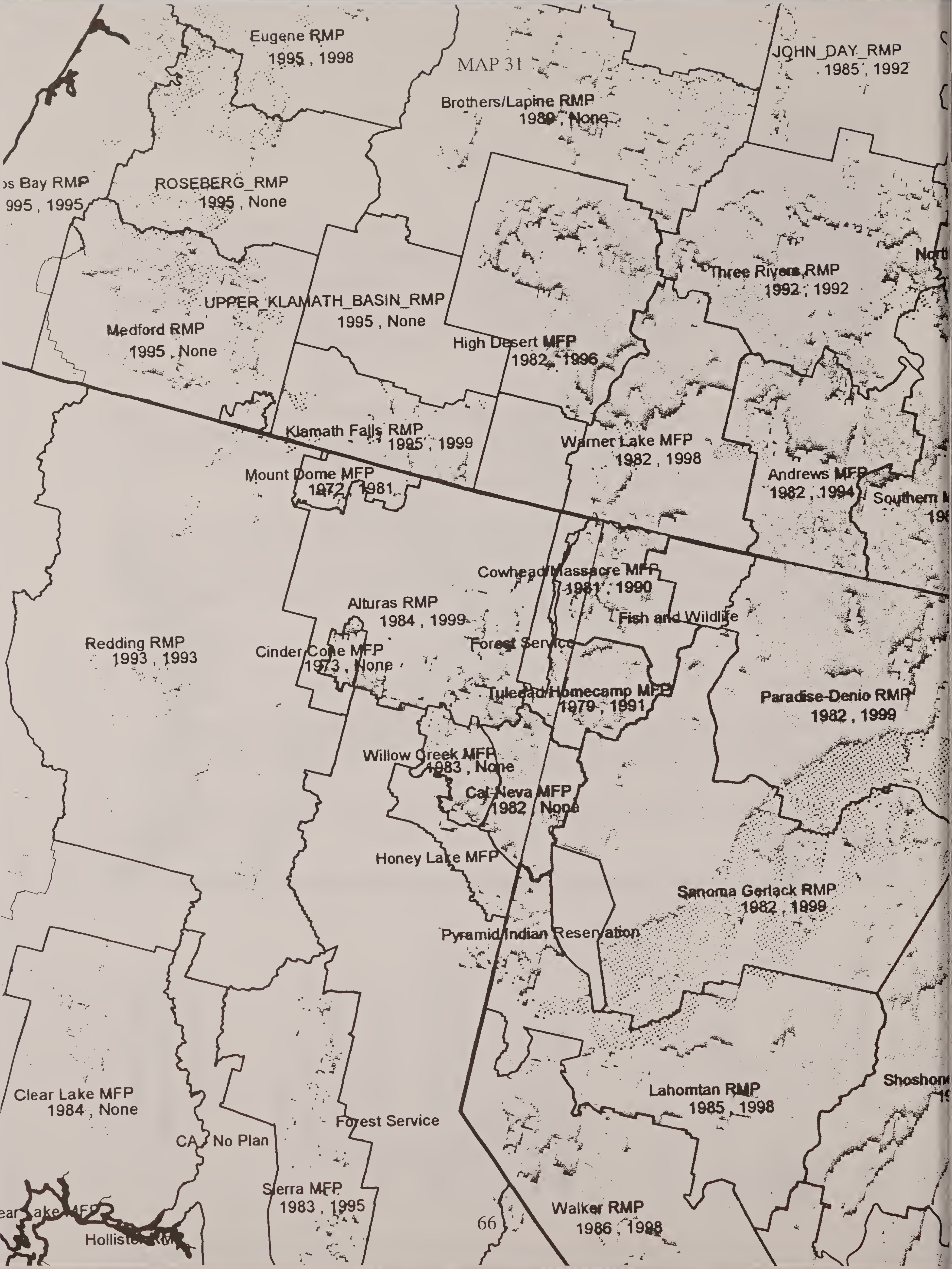
Another question is the name of the river in the downstream part (left side) of its course. The "Bull Run River" and "Sandy River" combine to produce … what? Do these two rivers become the "Bull Run River" or the "Sandy River," or a different river name entirely? The joining of rivers and streams must be taken into account and labeled, so that the reader always knows the correct nomenclature of the resulting confluence.

Other concerns:

The location map could have "Map Location" and an accompanying arrow added, to make it easier to spot the actual site of the main map. Also "Oregon" could be shifted into the empty space in the center of the state outline.

The scale bar should have divisions (but not necessarily numbers) added at the 1 and 3 mile locations.

The north compass rose would look better if it was *centered* above the BLM logo.



MAP 31

Eugene RMP
1995 , 1998
JOHN_DAY_RMP
1985 , 1992
Brothers/Lapine RMP
1989 , None
›s Bay RMP
995 , 1995
ROSEBERG_RMP
1995 , None
Three Rivers RMP
1992 , 1992
Nort
UPPER_KLAMATH_BASIN_RMP
1995 , None
Medford RMP
1995 , None
High Desert MFP
1982 , 1996
Klamath Falls RMP
1995 , 1999
Warner Lake MFP
1982 , 1998
Mount Dome MFP
1972 , 1981
Andrews MFP
1982 , 1994
Southern
19
Cowhead/Massacre MFP
1981 , 1990
Alturas RMP
1984 , 1999
Fish and Wildlife
Redding RMP
1993 , 1993
Cinder Cone MFP
1973 , None
Forest Service
Tuledad/Homecamp MFP
1979 , 1991
Paradise-Denio RMP
1982 , 1999
Willow Creek MFP
1983 , None
Cal-Neva MFP
1982 , None
Honey Lake MFP
Sanoma Gerlack RMP
1982 , 1999
Pyramid Indian Reservation
Clear Lake MFP
1984 , None
Lahomtan RMP
1985 , 1998
Shoshon
1
Forest Service
CA No Plan
Sierra MFP
1983 , 1995
ear Lake MFP
Walker RMP
1986 , 1998
Hollister RMP

MAP 31

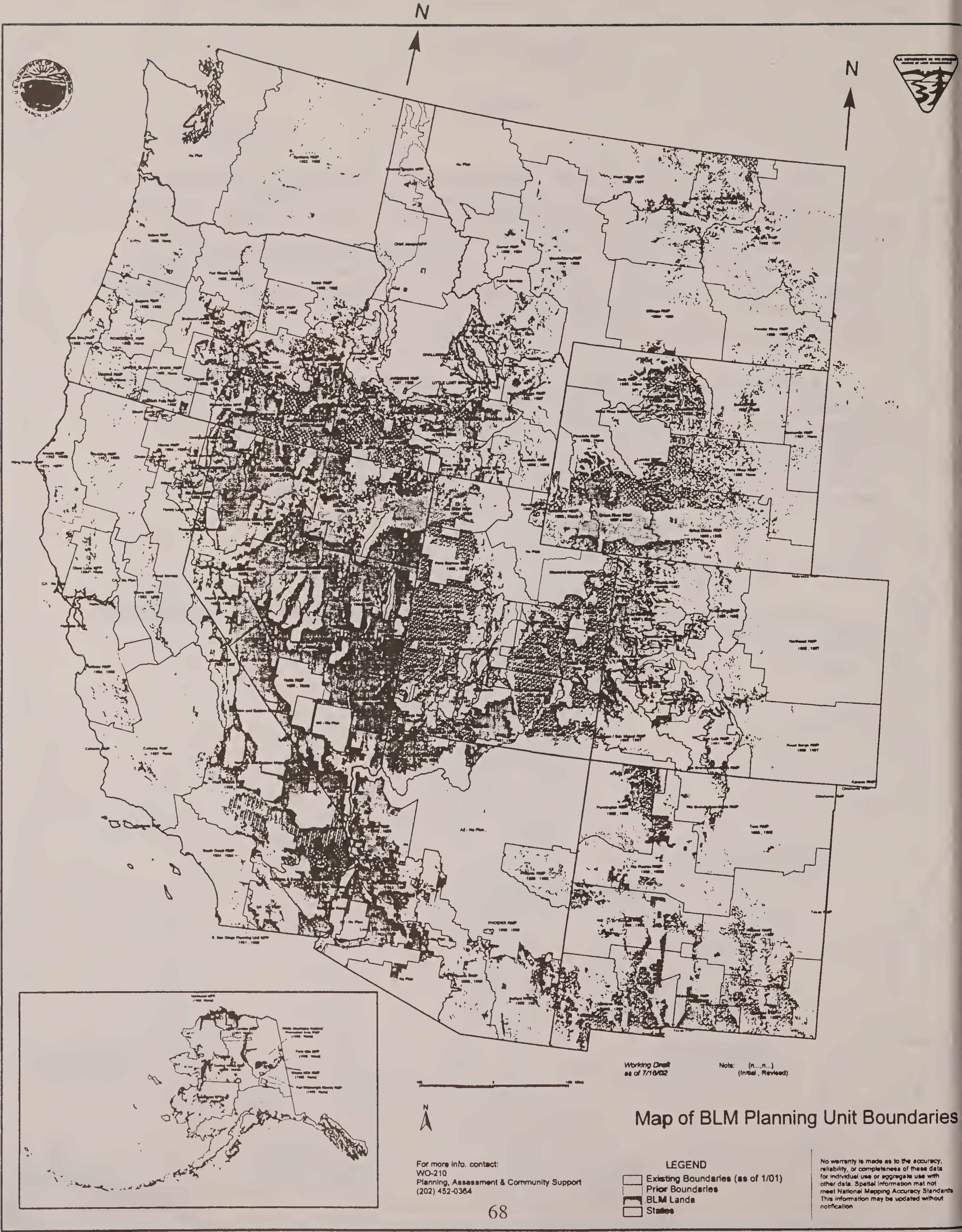
This is a segment of a much larger map. The original is in color, so it is somewhat easier to read than this black & white reproduction. However, it is still a fairly complex map and one of the difficulties is in deciphering the geographical locations of some of the labels. This is especially apparent in the central part of the map. What is needed, is a recentering of some of the text so it is easier to ascertain which areas they refer to. This may also require the "stacking" of some of the lines of text or (better yet) placing these labels in more "empty areas" of the map and using leder lines. The idea is to make it as easy as possible for the reader to make the connection between the names and the regions to which they apply.

Another problem, akin to spelling errors, is the nonuniform use of type case. Most of the map uses upper and lower case labels, but note for example "ROSENBERG_RMP" and "UPPER_KALAMATH_BASIN_RMP." These names have been placed in all upper case ("RMP" is correct, of course) and also display connecting word underlines. These inconsistencies should have been caught during an earlier editing stage of the mapmaking process.

Other concerns:

This map would have been better if it had been oriented with north directly at the top and the lines of text run *with* the latitude orientation.

MAP 32



Working Draft
as of 7/16/02

Note: (n...,n...)
(Initial , Revised)

Map of BLM Planning Unit Boundaries

For more info. contact:
WO-210
Planning, Assessment & Community Support
(202) 452-0364

LEGEND

☐ Existing Boundaries (as of 1/01)
Prior Boundaries
BLM Lands
☐ States

No warranty is made as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Spatial information mat not meet National Mapping Accuracy Standards This information may be updated without notification

MAP 32

The original size of this map was 33" X 41" so it has been greatly reduced in order to fit in this page-size format. Most of the text and other data consequently cannot be seen. However, I want to point out two problems that *are* visible.

First, the north arrow is basically incorrect. If you look at the north-south linear boundaries of the states (which *do* point north), you will note that longitudinal north is actually to the upper right of the top of the map. (Arrows have been added at the top to denote this.) Although the north arrow indicates the "very general" northerly direction, it is in fact inaccurate. One solution to this problem would be to tilt the north arrow so that it points correctly. Another solution would be to omit it entirely, as it is usually assumed (unless indicated otherwise) that north is "up" on most maps. Probably the best answer to this difficulty would be to reorient the entire map so that north is really straight up.

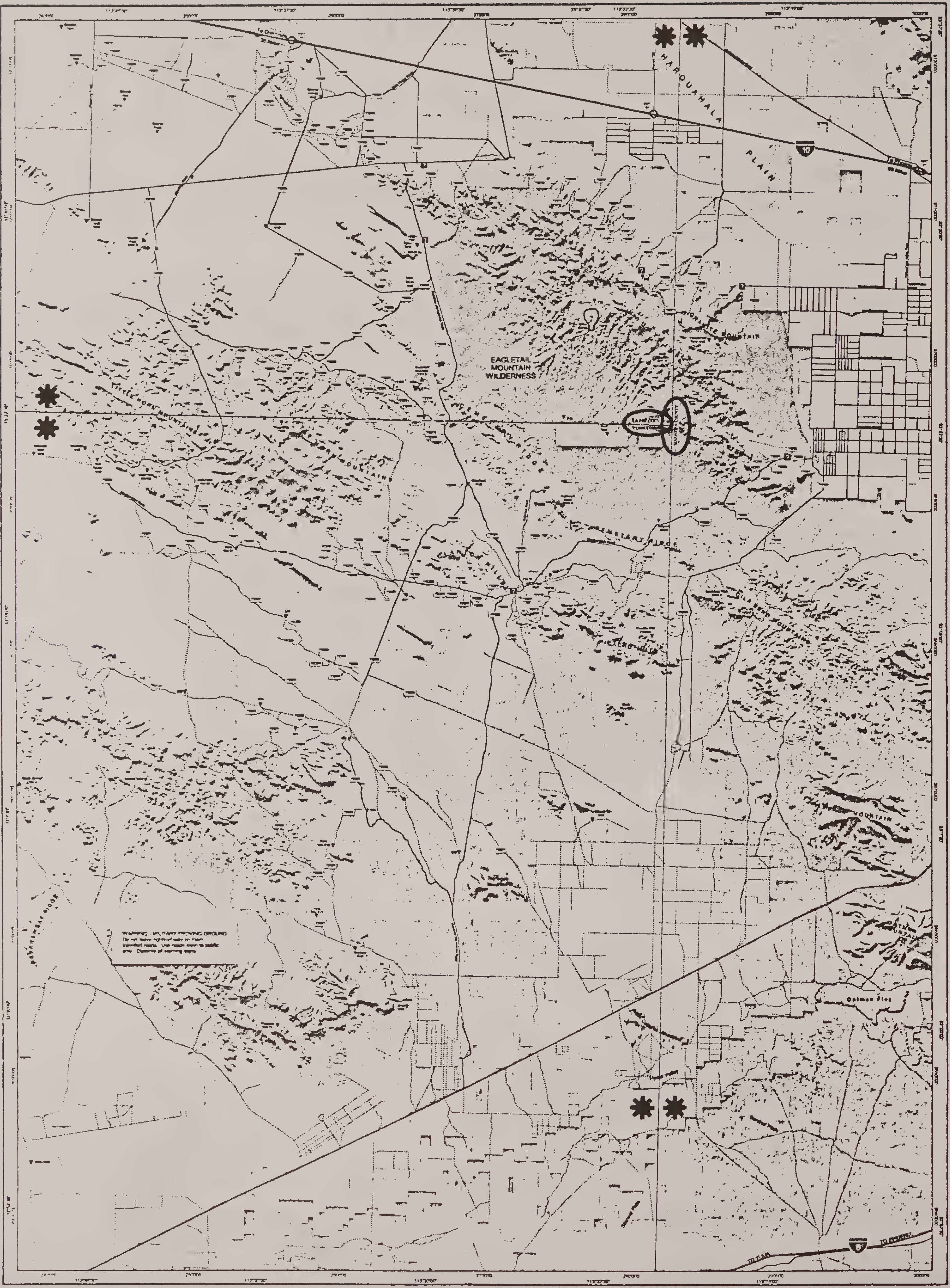
The second problem is that only one scale is included on the map. In reality it goes with the main map of the Western U.S. However, it is next to the inset map of Alaska and an uninformed reader might erroneously conclude that it applies to that map also. This is obviously not correct; Alaska is much larger (in proportion to the main map) than is indicated here. Thus, a second scale of appropriate length should be included within the Alaska inset map.

Other concerns:

At the bottom of the map where a line of text reads "For more info. contact:," it should say "For more information contact:." These types of abbreviations should not be used.

MAP 33

Yuma East
Off - Highway Vehicle Guide Map

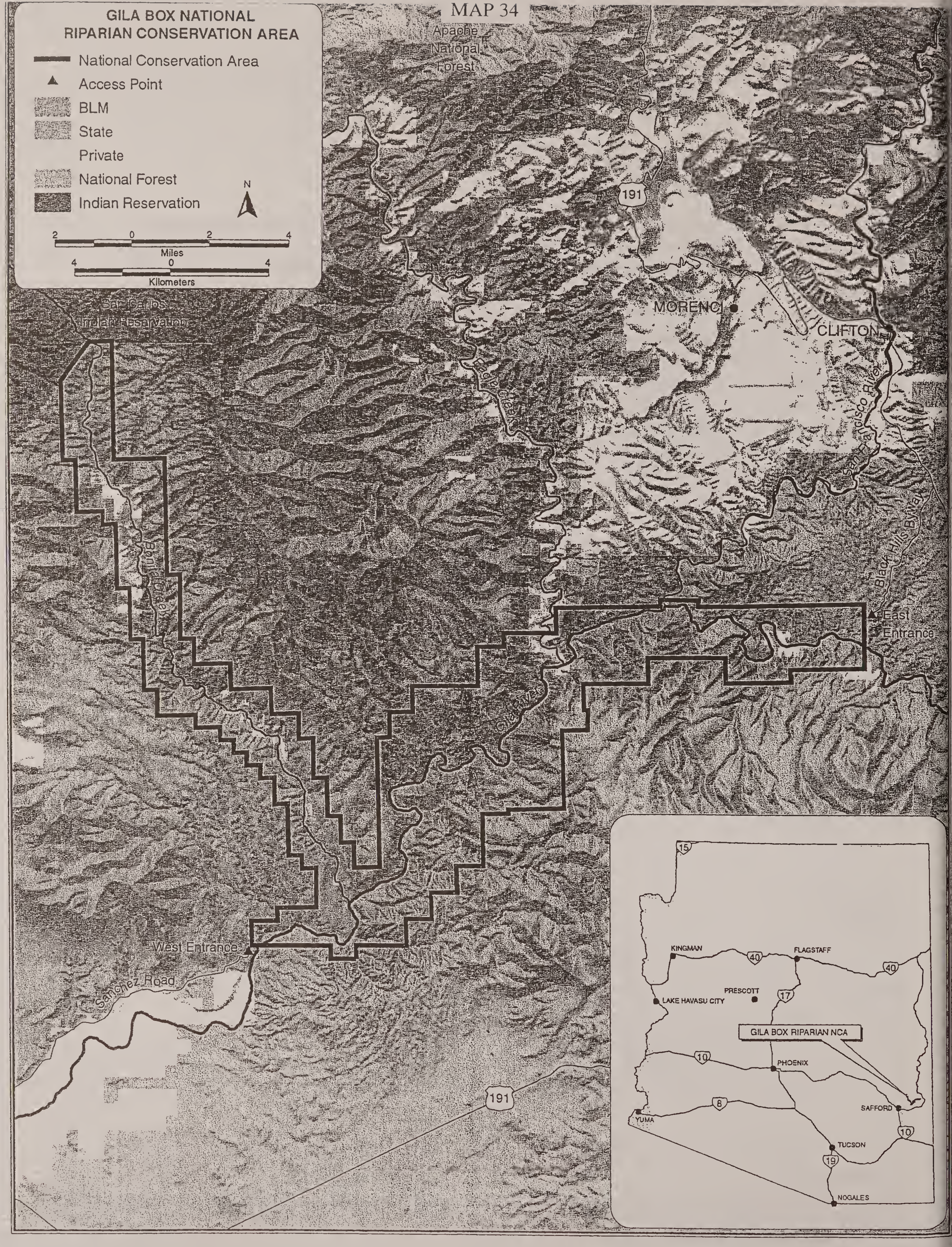

HARQUAHALA PLAIN
10
EAGLETAIL MOUNTAIN WILDERNESS
LITTLE HORN MOUNTAINS
CEMETERY RIDGE
GILA BEND MOUNTAINS
MOUNTAIN
Oatman Flat
WARNING - MILITARY PROVING GROUND
8
TO YUMA
TO PHOENIX

MAP 33

This is a greatly reduced copy of a map that was originally in the 2.5' X 3' size range. The main item I want to point out here is the labeling of the county names. They are located to the upper right of the map center and are circled. (For a closer look at these names see the lower center of Map 15, which is an enlargement of part of this map.) The boundary lines of 3 counties meet here – La Paz, Yuma, and Maricopa – and this is an excellent place to situate the county labels. However, this is the *only* place where they were labeled. As you can see, the county boundaries extend across the map, both east-west and north-south. On a large chart like this one (the original size, of course) you are requiring the reader to search all across the map looking for the names, if you only use them in one place. It is far better to periodically repeat the labels (where space is available for them). This makes it faster and easier for the map reader to comprehend this information. In this example, the county names could be repeated again near the left side and bottom of the map (indicated by asterisks here). Even a label near the top of the map (also indicated) would not be a bad idea.

In general, any lengthy feature that extends for quite a distance across a map – be it a county boundary, state boundary, river, mountain range, etc. – should be labeled as often as needed, in order to make the map more easily readable and understandable.

MAP 34


GILA BOX NATIONAL RIPARIAN CONSERVATION AREA
National Conservation Area
Access Point
BLM
State
Private
National Forest
Indian Reservation
N
2 0 2 4
Miles
4 0 4
Kilometers
Apache National Forest
191
MORENCI
CLIFTON
San Carlos Indian Reservation
Eagle Creek
San Francisco River
Black Hills Byway
Bonita Creek
Gila River
East Entrance
West Entrance
Sanchez Road
191
15
KINGMAN
40
FLAGSTAFF
40
PRESCOTT
17
LAKE HAVASU CITY
GILA BOX RIPARIAN NCA
10
PHOENIX
8
SAFFORD
YUMA
10
TUCSON
19
NOGALES

MAP 34

Map 34 is a reproduction of a page-sized color map. It is shown here at original size so that you can see the context of the items to be discussed. These items are the text for the "San Francisco River" and "Black Hills Byway" located on the right side of the map. In order to see them better this area is enlarged on Map 35, which is where they are commented upon. However, there are a few other improvements that could be made to this map, as detailed below.

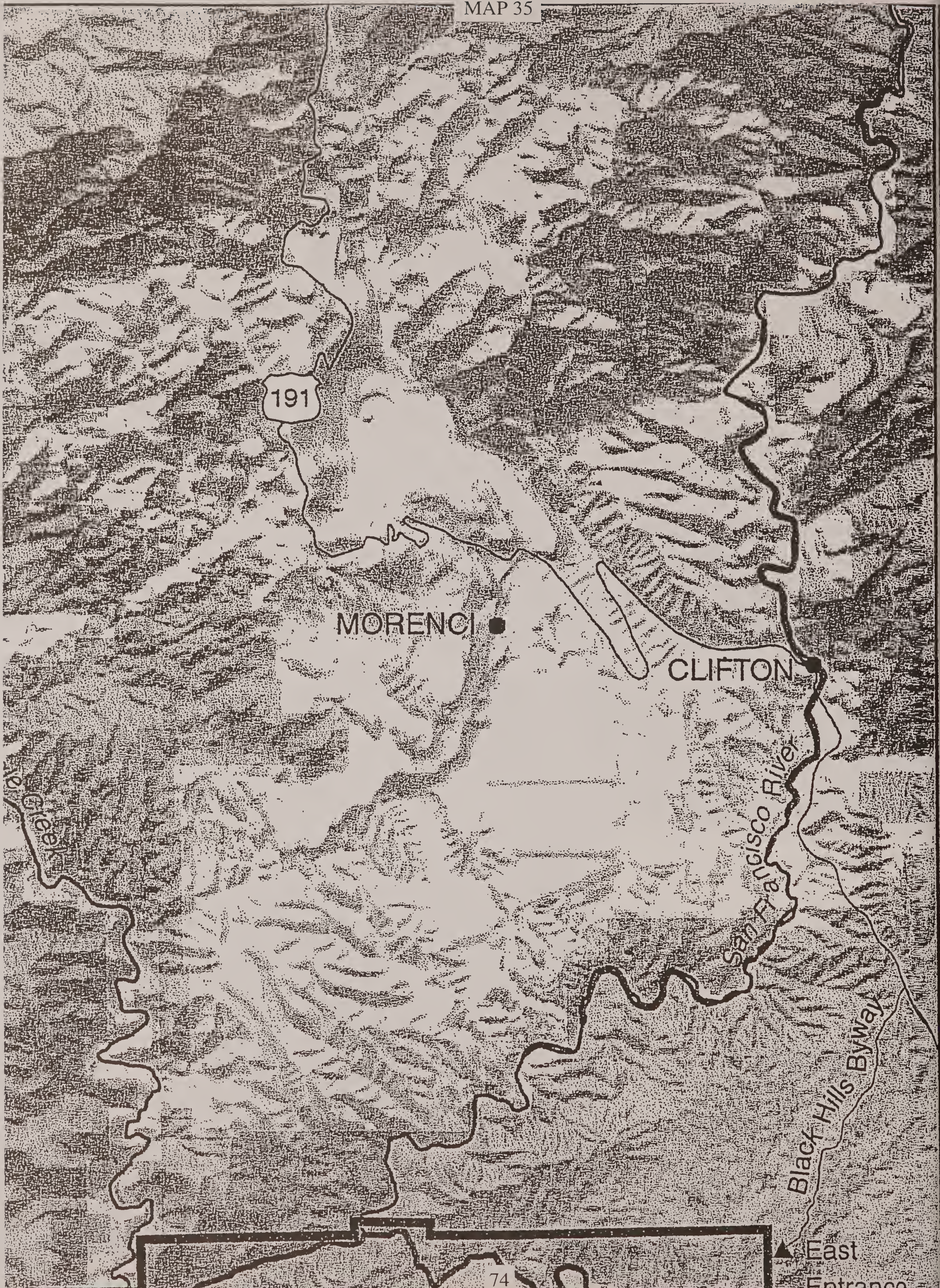
Other concerns: (These comments apply to the location diagram, which should be labeled "Location Diagram.")

All the city names are too small; they are below the recommended minimum 6 point type size. There is plenty of space available to enlarge these names. I suggest utilizing it.

The addition of a *simple* bar scale to the location diagram would make it more informative. A single bar showing "100 miles" would enable the reader, for example, to quickly estimate the distance from Phoenix to the Gila Box Riparian NCA.

I suggest adding "Arizona" to the location map. Nowhere on this page is the state name included.

Mistakes even happen in the title. This one reads "Gila Box National Riparian Conservation Area," when it should say "Gila Box Riparian National Conservation Area." (This is one more example of the necessity of map editing.)

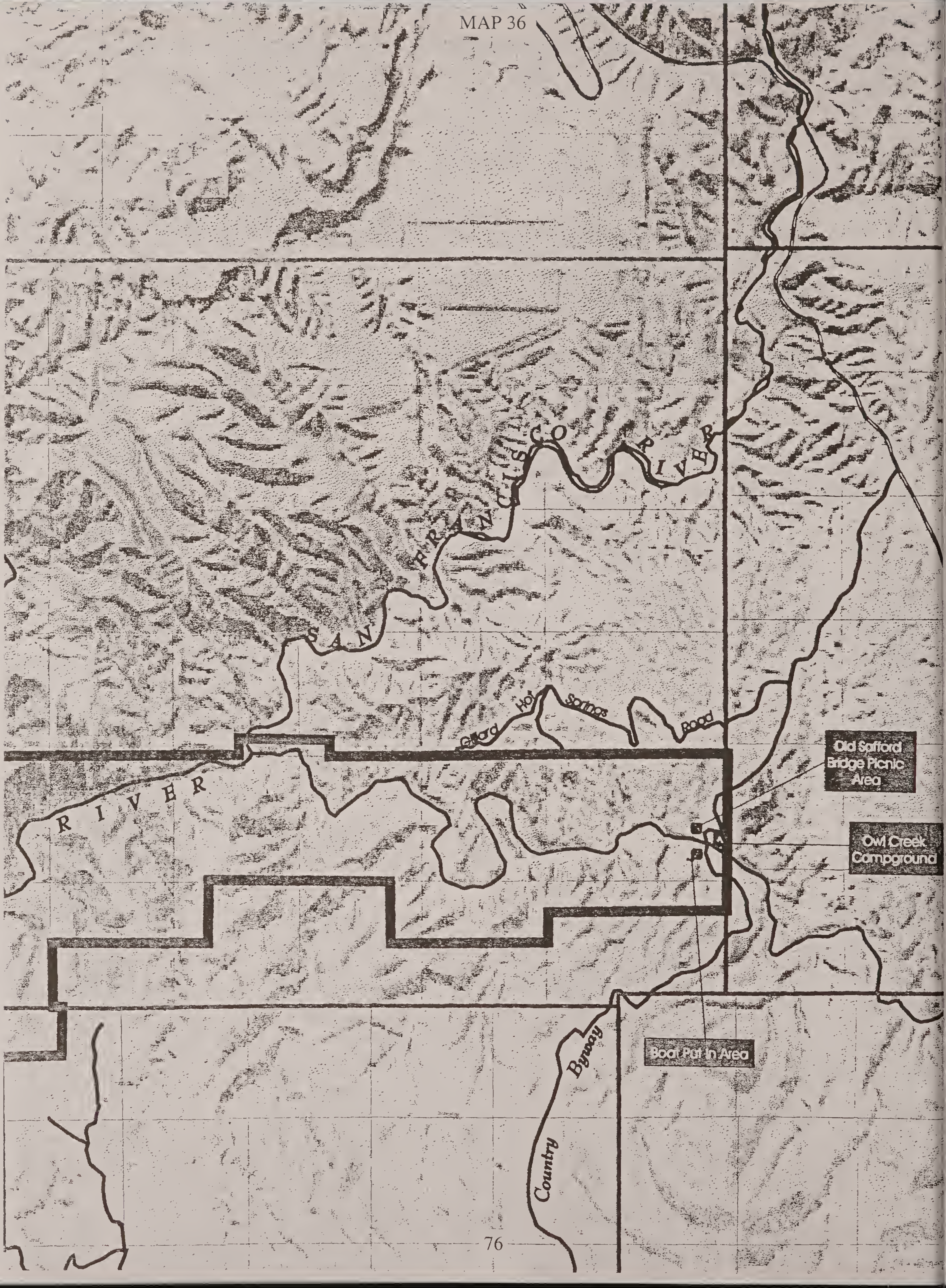

191
MORENCI
CLIFTON
San Francisco River
e Creek
Black Hills Byway
East Entrance

MAP 35

This is an enlargement of part of Map 34. Note the text for the "San Francisco River" and "Black Hills Byway." As already mentioned in Map 28, it is not necessary to follow every curve when labeling rivers, roads, or other linear features. A *smoothed* line of text that generally follows the feature is sufficient and, in most cases, is actually easier to read.

For an example of the smoothing of these particular labels, see Appendix III.

MAP 36


SAN FRANCISCO RIVER
RIVER
Gillard Hot Springs Road
Old Safford Bridge Picnic Area
Owl Creek Campground
Boat Put In Area
Country Byway

MAP 36

Map 36 covers some of the same territory as Maps 34 and 35. It also has the same problem, only in the *extreme.* The text for "San Francisco River" is really convoluted in trying to follow the river exactly. "Gillard Hot Springs Road" also needs improvement. As discussed previously, these labels should be smoothed so they *generally* follow the feature.

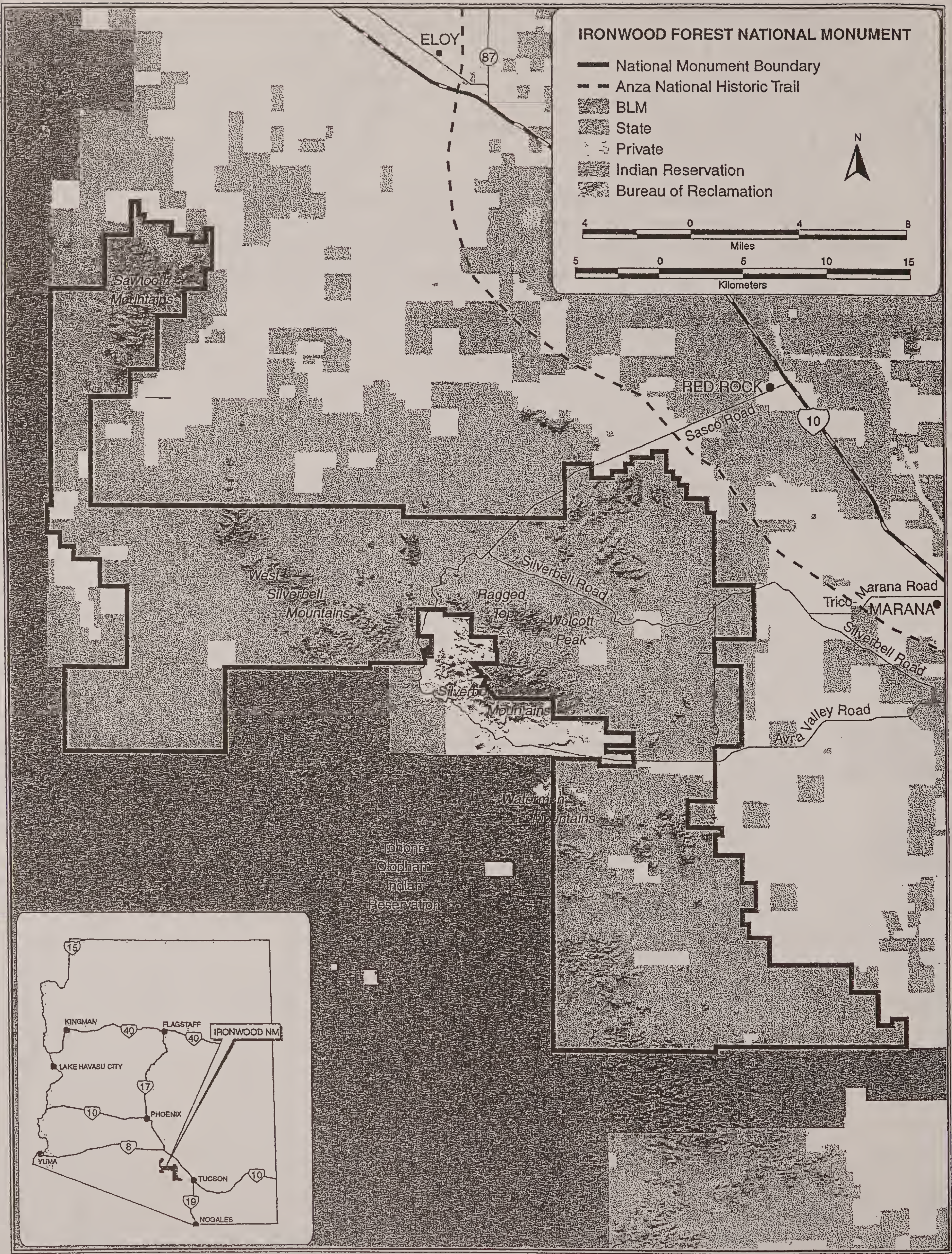
See Appendix III for a sample of a better way to position the text.

Other concerns:

The text "Country Byway" should not be in italics; it is not a hydrographic feature.

The leder line for the "Boat Put In Area" is "off target" (to the left) and should be adjusted.

MAP 37


IRONWOOD FOREST NATIONAL MONUMENT
National Monument Boundary
Anza National Historic Trail
BLM
State
Private
Indian Reservation
Bureau of Reclamation
N
4
0
4
8
Miles
5
0
5
10
15
Kilometers
ELOY
87
RED ROCK
10
Sasco Road
Sawtooth Mountains
West Silverbell Mountains
Ragged Top
Wolcott Peak
Silverbell Road
Trico-Marana Road
MARANA
Silverbell Road
Silverbell Mountains
Avra Valley Road
Waterman Mountains
Tohono O'odham Indian Reservation
15
KINGMAN
40
FLAGSTAFF
40
IRONWOOD NM
LAKE HAVASU CITY
17
10
PHOENIX
8
YUMA
TUCSON
10
19
NOGALES

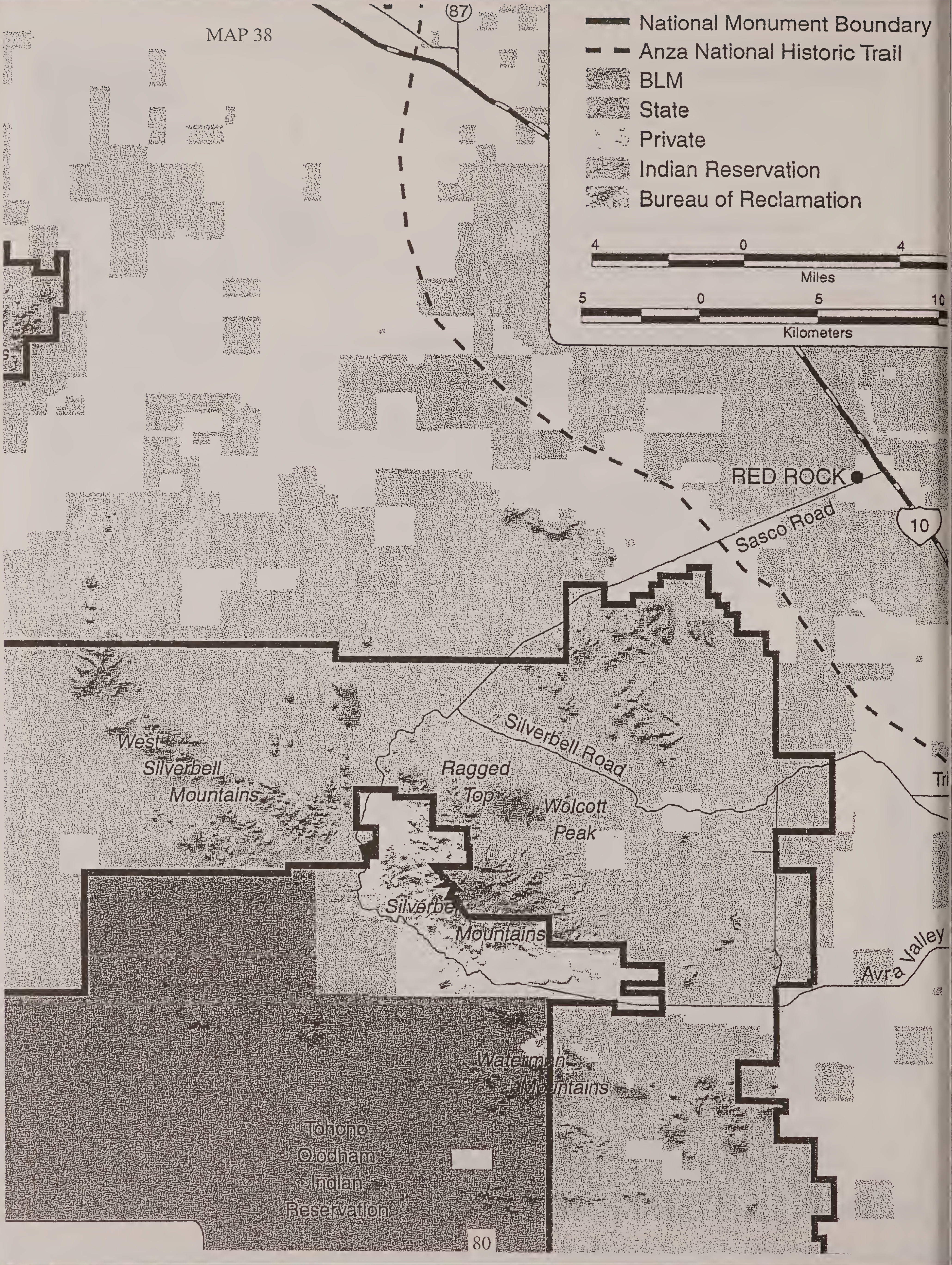
MAP 37

This map was originally in color and is displayed at its printed page size. The next two maps – 38 and 39 – are enlargements of parts of this map for further discussion, so this one is meant to place those two in context. However, a few items shown here should be commented upon.

In the location diagram (which probably should be labeled as such) the text for the cities is too small. There is ample space to make them larger, and thus more readable. Also, the "Ironwood NM" label has been placed in a poor location. It should be shifted down at least one-quarter of an inch so that it (1) does not cover the I-40 highway and (2) is closer to the site it is identifying. When placing text on a map always consider the location that will best identify the item while, at the same time, obscure as little of the other data as possible.

In the scale, the kilometer part of the scale should be in *even* increments to match the even increments of the mile scale. This will make distance comparisons between the two scales easier to comprehend.

MAP 38



National Monument Boundary
Anza National Historic Trail
BLM
State
Private
Indian Reservation
Bureau of Reclamation
4
0
4
Miles
5
0
5
10
Kilometers
87
RED ROCK
Sasco Road
10
West Silverbell Mountains
Silverbell Road
Ragged Top
Wolcott Peak
Silverbell Mountains
Avra Valley
Waterman Mountains
Tohono O'odham Indian Reservation

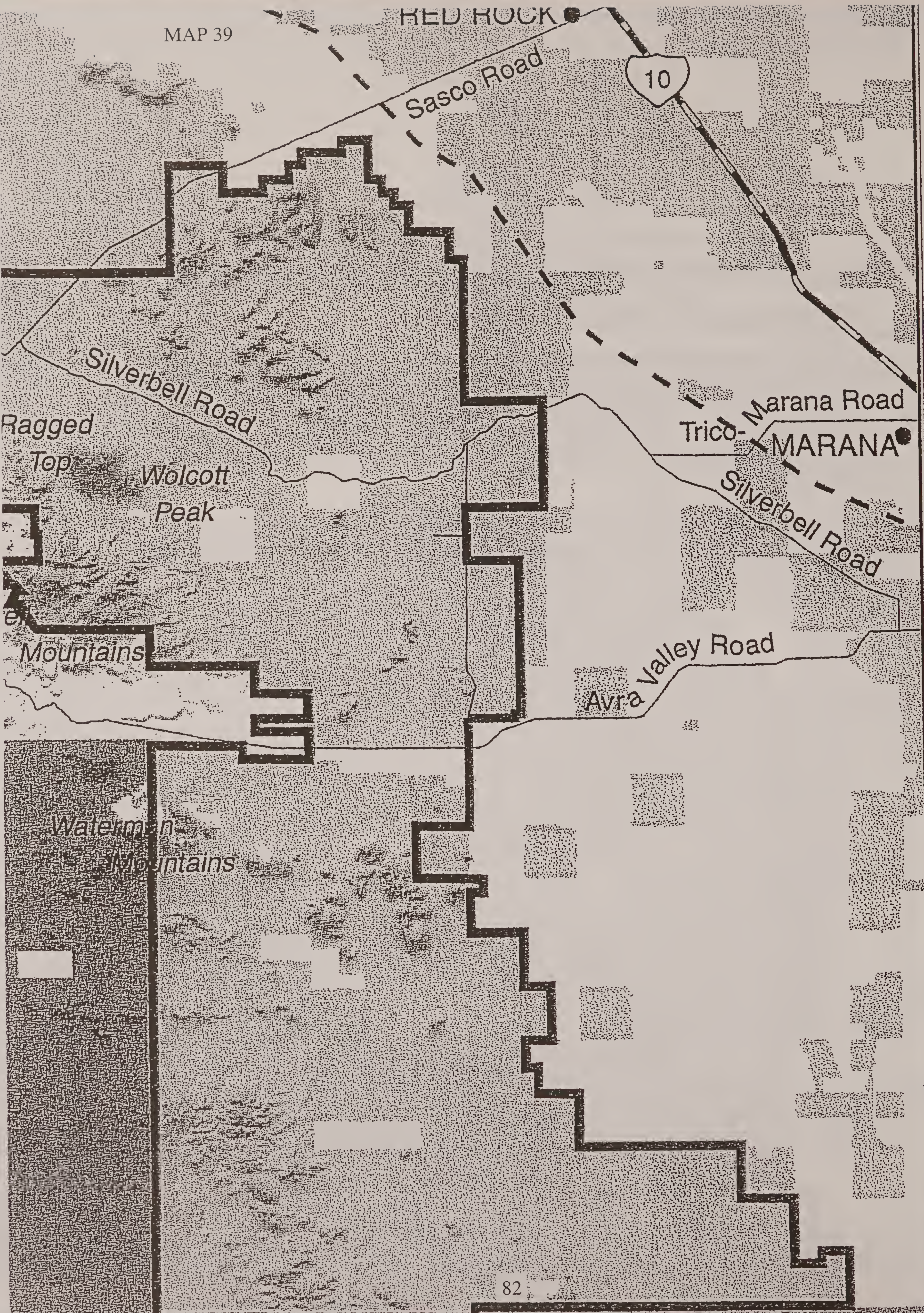
MAP 38

This map is an enlargement of part of Map 37. There are several questions with regard to the labels for the mountains and peaks shown here. The one item that applies to all of them is the fact that they shouldn't be in italic text. Cartographic convention reserves italics for hydrographic or "water" features of the landscape.

The text for both "Silverbell Mountains" and "Waterman Mountains" is obscured by a bold boundary line, making them hard to read. In these cases the labels should be moved so the line does not cross them. "Silverbell Mountains" could be placed either south-west or north-east of its present position. "Waterman Mountains" could be run in one line of text, with the boundary line between the two words. Alternatively, the text could be placed either west or east of the boundary line.

The label for "West Silverbell Mountains" tends to fall on top of the mountain range and partially obscures it. If the text was shifted slightly to the south-west, it would adequately identify the mountains without covering them.

MAP 39


RED ROCK
10
Sasco Road
Silverbell Road
Ragged Top
Wolcott Peak
Mountains
Trico-Marana Road
MARANA
Silverbell Road
Avra Valley Road
Waterman Mountains

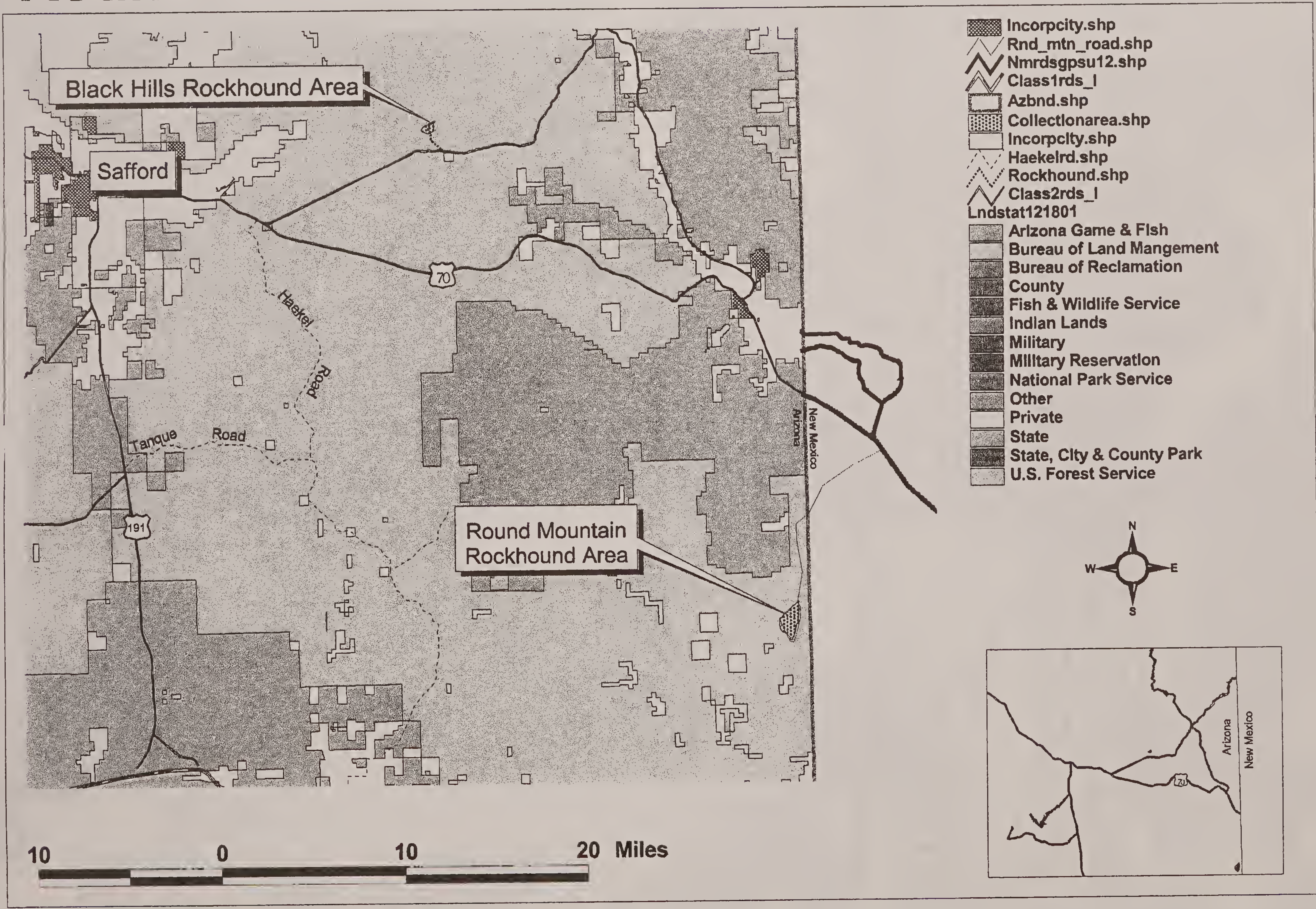
MAP 39

Map 39 is an enlargement of part of Map 37. Here the situation that could be improved is the curving of the text for two of the roads (although these examples are much better than previous samples reviewed in this document). "Trico-Marana Road" has a "drooping M," while "Avra Valley Road" follows the bend of the highway a little too closely. In both cases, a more gradual curving of the text would be more visually effective. Appendix III shows how this could be done.

Other concerns:

The shield shape for Interstate 10 is rather odd looking. The *official* shield outlines should be selected and used for interstates and all other roads that use shield symbols.

Round Mountain Rockhound Area



Black Hills Rockhound Area
Safford
70
Haekel Road
Tanque Road
191
Round Mountain Rockhound Area
Arizona
New Mexico
Incorpcity.shp
Rnd_mtn_road.shp
Nmrdsgpsu12.shp
Class1rds_l
Azbnd.shp
Collectionarea.shp
Incorpcity.shp
Haekelrd.shp
Rockhound.shp
Class2rds_l
Lndstat121801
Arizona Game & Fish
Bureau of Land Mangement
Bureau of Reclamation
County
Fish & Wildlife Service
Indian Lands
Military
Military Reservation
National Park Service
Other
Private
State
State, City & County Park
U.S. Forest Service
N
W
E
S
Arizona
New Mexico
70
10
0
10
20 Miles

MAP 40

MAP 40

This was a preliminary test map and not a final version, however it provides the opportunity to address a number of mapping questions. Probably the main concern is the fact that the "Round Mountain Rockhound Area" (the whole *purpose* of the map) is located way off to the right side of the map. Practically nothing to the east of this area is shown. In general, the entire New Mexico side of this map needs to be extended, with more geographical information added. The only apparent road to the site is a very thin line. One would wonder what the quality of this road is, and therefore what type of vehicle could negotiate it. Since the "Round Mountain Rockhound Area" is the reason for this map it should have the second largest text, after the title. The original map is in color, showing land status. But is land status necessary for what is basically a *location* map? It would be much less complex (and thus easier to read) if just the most important factors were included: site location, roads to it, and surrounding towns and natural features for context.

Other concerns:

In the legend, roads should be shown as *straight* not zigzag lines. Also, only about 5 of the land status entities in the legend are actually included on the map. The rest should be omitted.

The location diagram provides very little information. It should show the map's location within a much larger region (preferably the state).

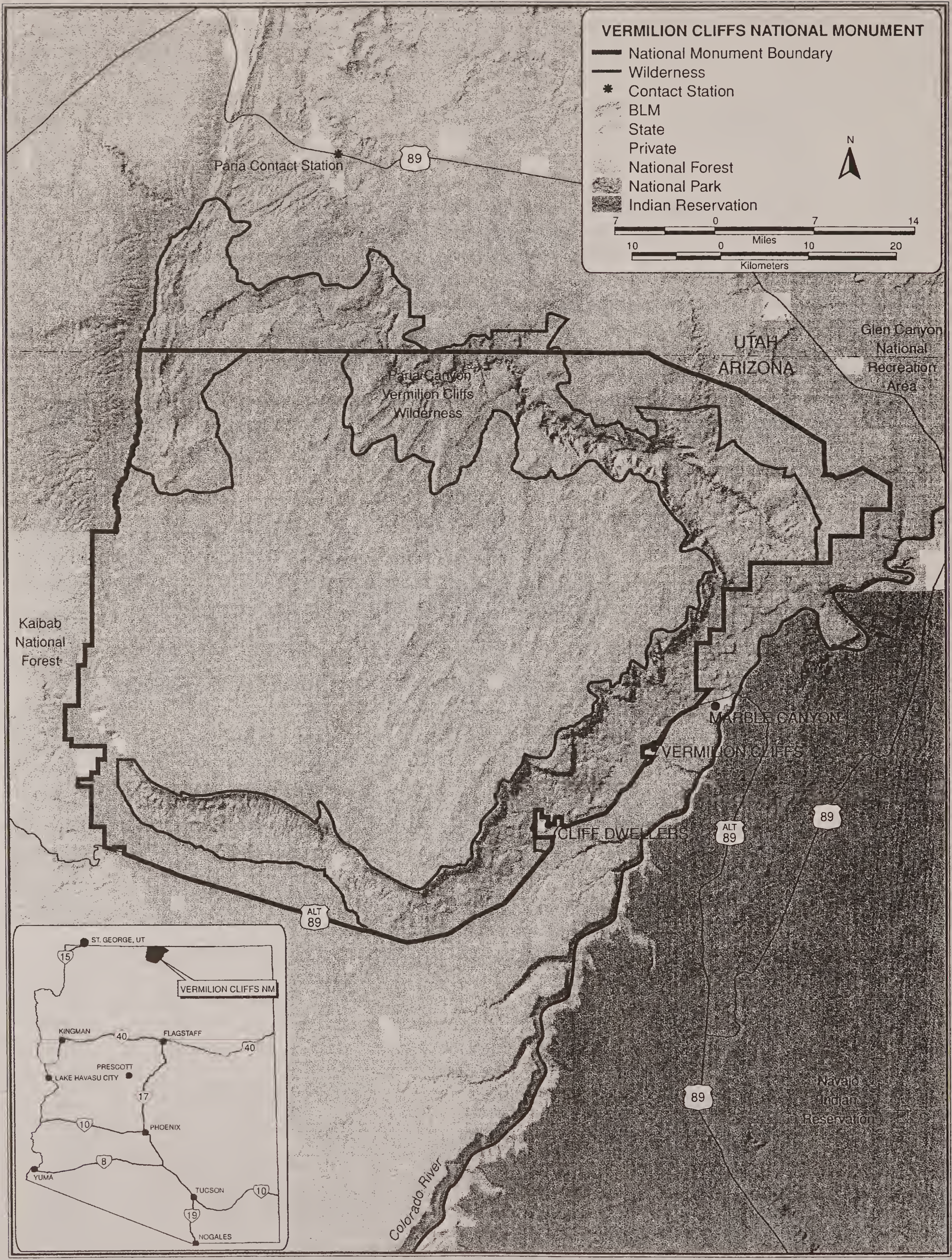
The scale is a little too bold. A kilometer scale should also be included.

The word "Road" on "Haekel Road" is upside-down. But why include "Haekel Road" and "Tanque Road" anyway? They are far from the "Round Mountain Rockhound Area" site and don't lead to it at all.

The numbers "70" and "191" are off-center in their respective highway shields.

The route "191" road does not connect (there are gaps) with the interstate in the bottom left corner of the map.

MAP 41


VERMILION CLIFFS NATIONAL MONUMENT
National Monument Boundary
Wilderness
Contact Station
BLM
State
Private
National Forest
National Park
Indian Reservation
N
7
0
7
14
Miles
10
0
10
20
Kilometers
Paria Contact Station
89
UTAH
ARIZONA
Glen Canyon National Recreation Area
Paria Canyon Vermilion Cliffs Wilderness
Kaibab National Forest
MARBLE CANYON
VERMILION CLIFFS
CLIFF DWELLERS
ALT 89
89
ALT 89
Navajo Indian Reservation
89
Colorado River
ST. GEORGE, UT
15
VERMILION CLIFFS NM
KINGMAN
40
FLAGSTAFF
40
PRESCOTT
LAKE HAVASU CITY
17
10
PHOENIX
8
YUMA
TUCSON
10
19
NOGALES

MAP 41

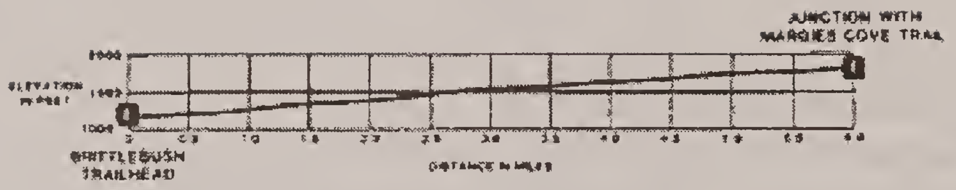
The main problem with this map concerns two aspects of the scale. First, the mile scale is divided into "0," "7," and "14" mile increments. This means that the first division to the left of the "0" is 3.5 miles. This type of a measurement is hard to visualize on a map. All scale divisions should be in *even* numbers, so fractions do not occur. This is a general rule to follow with all scales on all maps. However, the critical problem with this scale (both miles and kilometers) is that it is incorrect. It is the *wrong length* and is consequently showing erroneous distance measurements on the map! This points up the importance of a detailed review and edit of every map before it is published – *including* its scale.

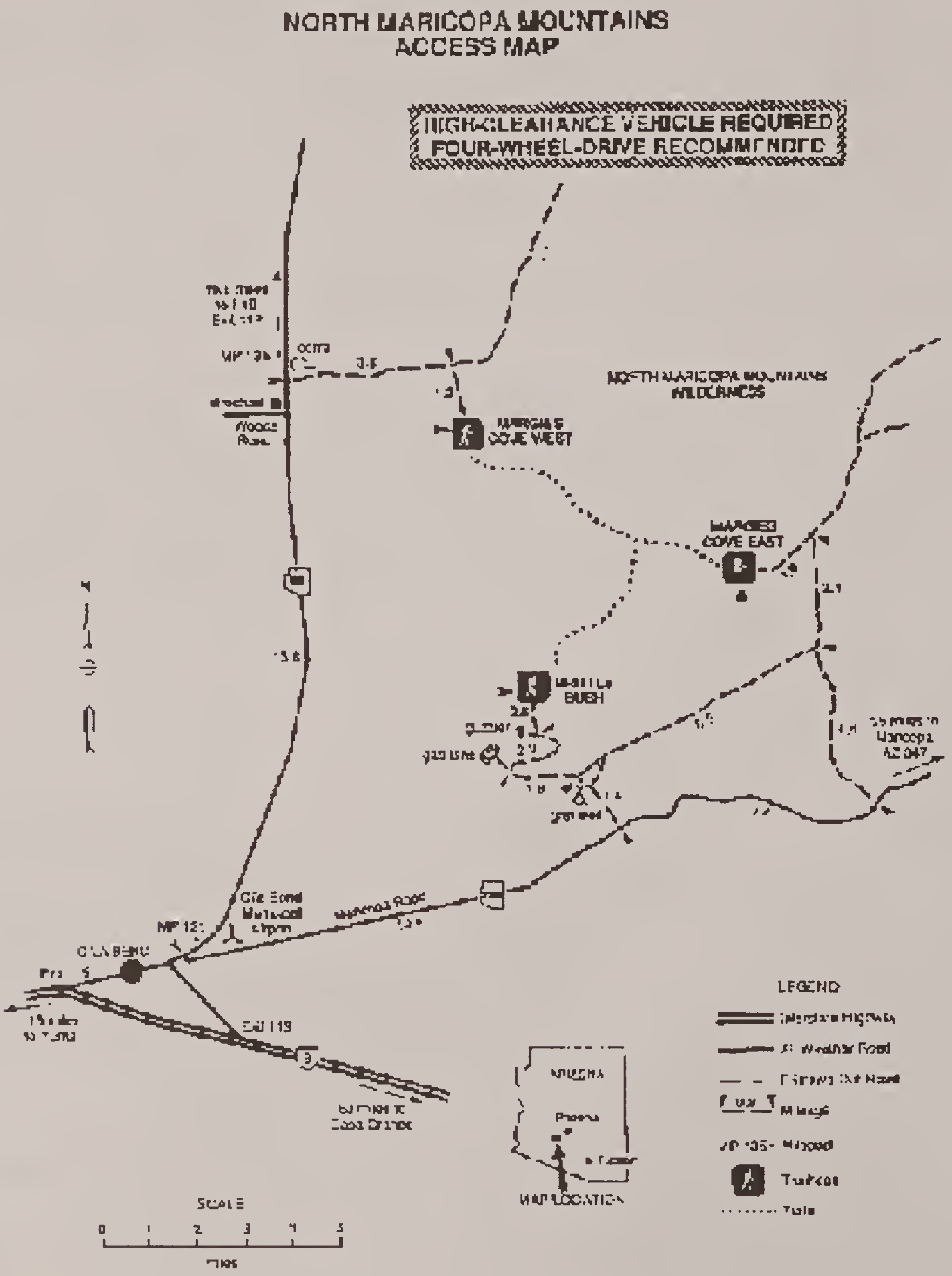
Other concerns:

The text in the location diagram is too small. It could be made larger (at least to 6 point) as there is adequate space.

The boundary lines between the "National Monument Boundary" and "Wilderness" merge in several places on the map, so the one "underneath" can't be seen and thus is hard to follow. (This is as true on the original color version of this map as it is on this black & white reproduction.) Whenever possible it is best to draw boundary lines, which occupy the same position, side-by-side for visual purposes. In this way their locations may be tracked throughout their total length.

MAP 42


JUNCTION WITH
MARGIES COVE TRAIL
ELEVATION IN FEET
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
BRITTLEBUSH
TRAILHEAD
DISTANCE IN MILES

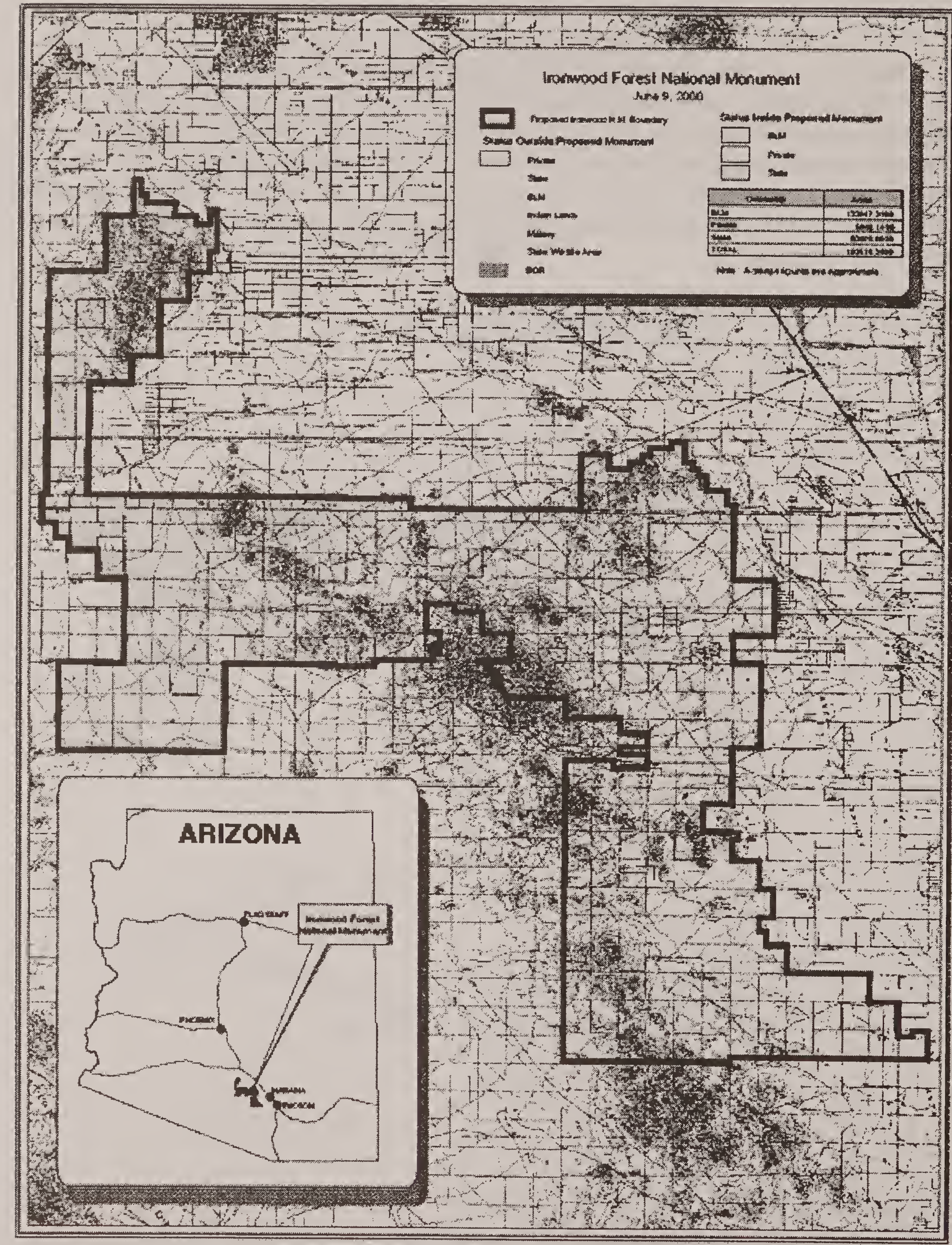

NORTH MARICOPA MOUNTAINS
ACCESS MAP
HIGH-CLEARANCE VEHICLE REQUIRED
FOUR-WHEEL-DRIVE RECOMMENDED
NORTH MARICOPA MOUNTAINS
WILDERNESS
MARGIES COVE WEST
MARGIES COVE EAST
BRITTLE BUSH
13.6
GILA BEND
Gila Bend
Municipal
Airport
Maricopa Road
LEGEND
Interstate Highway
All Weather Road
Primitive Dirt Road
Mileage
Milepost
Trailhead
Trails
ARIZONA
Phoenix
Tucson
MAP LOCATION
SCALE
0
1
2
3
4
5
miles

MAP 42

Map 42 is an Internet product. The original illustration was a page-sized line drawing. As is obvious from this visual, the scanning of the map into digital form has rendered it essentially unreadable. Very little of the text is legible and the line quality is very poor. Amazingly enough, this map remained on the web for a considerable length of time. This points up two factors. First, the map should have been reviewed *on the Internet* and either improved or removed entirely. Second, a much better quality scan should have been done in order to achieve an acceptable product.

MAP 43

Ironwood Forest National Monument Boundary Map

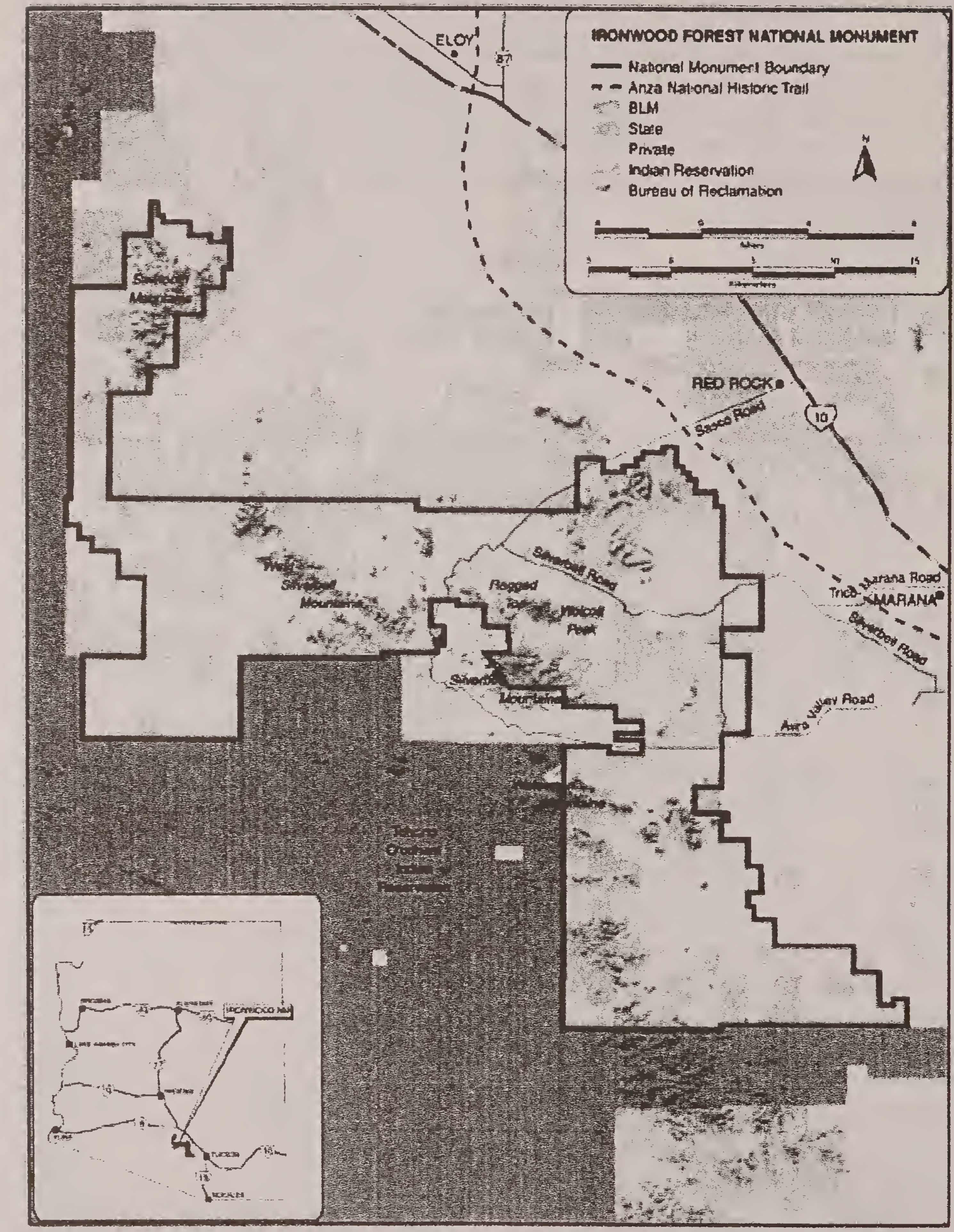

Ironwood Forest National Monument
June 9, 2000
Proposed Ironwood N.M. Boundary
Status Outside Proposed Monument
Private
State
BLM
Indian Lands
Military
State Wildlife Area
BOR
Status Inside Proposed Monument
BLM
Private
State
Ownership
Acres
BLM
Private
State
TOTAL
Note: Acreage figures are approximate.
ARIZONA
FLAGSTAFF
PHOENIX
MARANA
TUCSON
Ironwood Forest National Monument

MAP 43

This is another Internet map that is considerably more complex than the previous one. Like Map 42 however, this one fails the "readable" – and thus "understandable" – test (remember "The Golden Rule of Cartography" on page 2). In fact, the only text that is legible here is "Arizona" and "Ironwood Forest National Monument" (*barely*). This map should have been reviewed and modified before it was ever placed on the Internet.

MAP 44

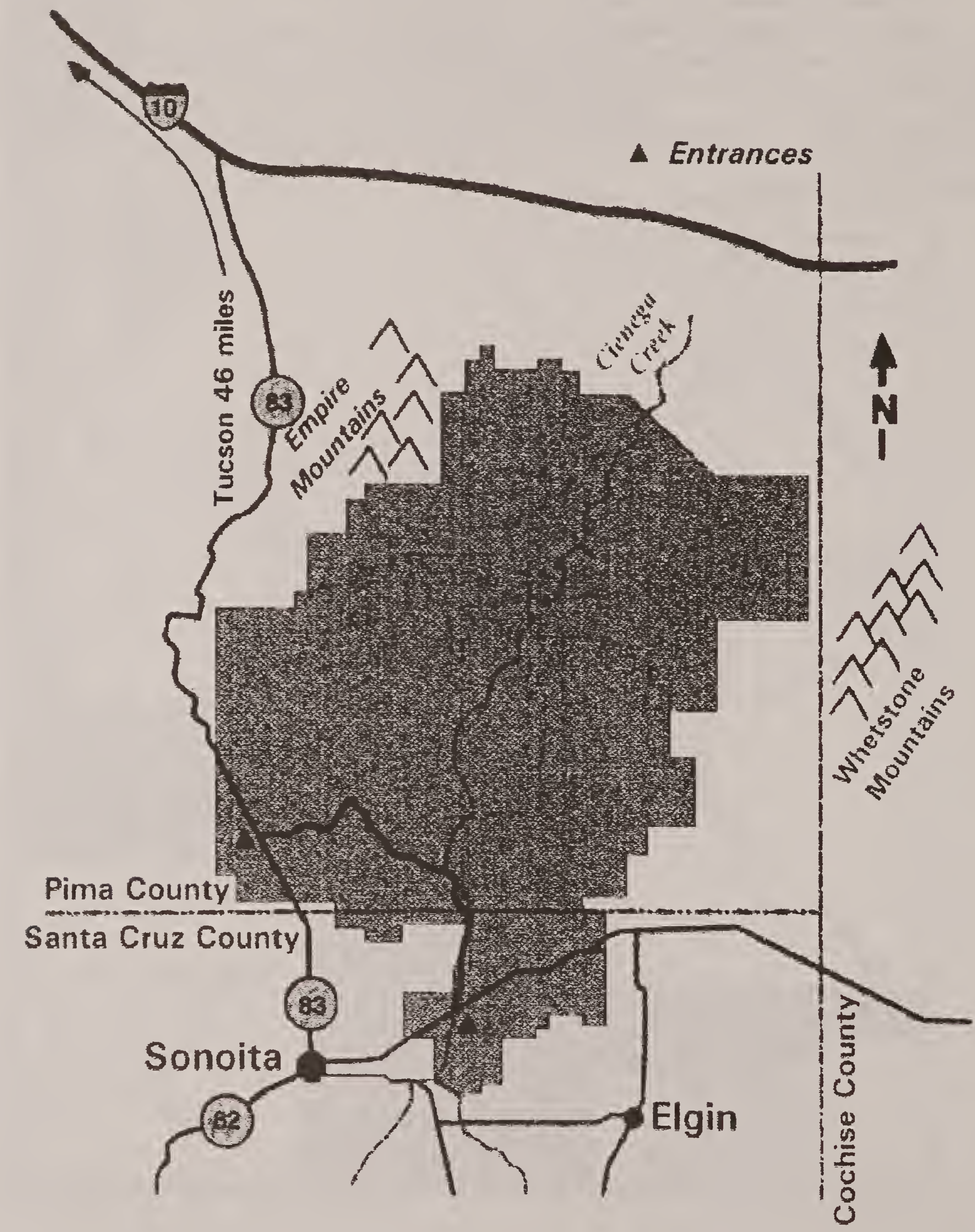
Ironwood Forest National Monument


IRONWOOD FOREST NATIONAL MONUMENT
National Monument Boundary
Anza National Historic Trail
BLM
State
Private
Indian Reservation
Bureau of Reclamation
N
ELOY
87
RED ROCK
10
Sasco Road
Silverbell Road
West Silverbell Mountains
Ragged Top
Wolcott Peak
Silverbell Mountains
Trico Marana Road
MARANA
Avra Valley Road
Tohono O'odham Indian Reservation
TUCSON
IRONWOOD NM
15
10
8

MAP 44

Map 44 is a simplified and improved version of Map 43. Now more of the text is readable and the map in general is easier to see. Still, it is not of acceptable quality. The smaller text (especially on the location map and scale) is too small to be seen. Note that this is the same illustration as Map 37, which is the printed version before being scanned for the Internet. This map will only be a quality product when everything that is readable on the printed copy is also legible on the web version.

Las Cienegas National Conservation Area Map


10
▲ Entrances
Tucson 46 miles
83
Empire Mountains
Cienega Creek
N
Whetstone Mountains
Pima County
Santa Cruz County
83
Sonoita
82
Elgin
Cochise County

MAP 45

This is the final map of the Internet series (Maps 42 – 45). I want to use this visual as an example of a successful web-designed mapping technique (although it still has plenty of shortcomings – see the *Other concerns:* below). Note the following: (1) The map is simple and thus easy to read. Only the most essential items for the map's actual purpose are included. (2) All the text is of a large enough size to be easily read. (3) Although the mountains are drafted in a "cartoon" fashion, they are easy to see and interpret – *as mountains*. Overall, this is an effective Internet map. It can be quickly read and comprehended by the viewer, and consequently is a successful web visual.

Other concerns:

The triangular symbol and the word "Entrances" shouldn't be located so close to the map – they might be interpreted as an actual site, in that location. The words "Legend" or "Key" could be added above them. Also "Entrances" shouldn't be in italics.

The label "Tucson 46 miles" doesn't tell us from where this distance is measured. (Is it from the National Conservation Area entrance, or the route 83 and I-10 intersection, or??)

"Empire Mountains" should not be in italic type. They are not a hydrographic feature.

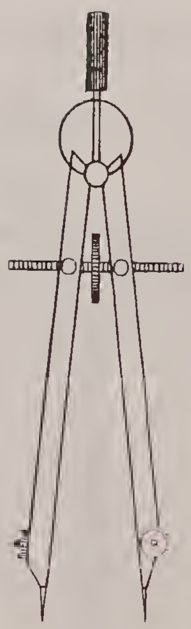
The road line within the National Conservation Area is too bold, implying a paved highway. In actuality it is a dirt road.

The road and border lines are of fairly poor quality. (It's difficult to distinguish the roads from the creek, at the bottom of the map.)

Another route 82 shield could be added on the east side of the map.

The "N" in the north arrow is slightly off-center, to the right.

This map needs a scale so that the reader can get a general idea of the distances involved. Just a simple single-line bar or rake scale will be adequate.



APPENDICES

Appendix I

TYPE SIZES

4 POINT TYPE Point Type

5 POINT TYPE Point Type

6 POINT TYPE Point Type – *smallest acceptable mapping size type*

7 POINT TYPE Point Type

8 POINT TYPE Point Type – *ideal smallest mapping size type*

9 POINT TYPE Point Type

10 POINT TYPE Point Type

11 POINT TYPE Point Type

12 POINT TYPE Point Type

14 POINT TYPE Point Type – *smallest acceptable slide / vugraph size type*

16 POINT TYPE Point Type

18 POINT TYPE Point Type – *ideal smallest slide / vugraph size type*

20 POINT TYPE Point Type

24 POINT TYPE Point Type – *smallest acceptable display / exhibit size type*

30 POINT TYPE Point Type

36 POINT TYPE Point Type

Appendix II: SUMMARY MAP EDIT

This is a sample of a map edit that I performed several years ago. I am including it here because it gives a good summary of many of the text problems encountered on the maps in this document. Reading through it will refresh the reader's memory about items to watch for and avoid, when constructing new maps.

This is also an example of an editing technique that I occasionally use when reviewing maps. (For a full description of editing methods, see the *Map Editing Guide* in the Bibliography.) Sometimes during a map review I will find the same types of mistakes repeated time after time. Rather than writing the same correction comment multiple times, I find it easier to just make a list and give each correction a number. (This also solves the problem of finding enough space to write all the comments on the map.) Pages 102 and 103 show how this is done in an actual edit. Page 104 is a reduced copy of this numbering scheme for a part of the map being reviewed. This was produced as a clear overlay – vellum could also be used – so that it could be placed on the original edited map. The numbers would then fall directly on top of the problem areas, thus designating them for correction. (Usually just placing the numbers beside the problem areas will be sufficient. In this particular case the map was so complex that an overlay was needed.)

The reader may be interested to know that the sample review map, on page 104, covers approximately the same area as that shown on Map 20 – at reduced scale. This was the original map (in color) that was edited.

ARIZONA
SURFACE MANAGEMENT RESPONSIBILITY MAP CORRECTIONS

Detailed Edit
August 1998
Stephen Meszaros
Visual Information Specialist
Bureau of Land Management
Arizona State Office, Phoenix
(602) 417-9342

The following numbered comments correspond to the similar numbers on the attached map overlay. This is for the "State of Arizona Surface Management Responsibility" map, at the scale of 1:800,000, dated February 1997.

1. Text hard or impossible to read. (The text is too small or the color contrast is too similar for the text to be easily readable.)
2. Text should not be in italics -- not a hydrologic feature. (Cartographic convention states that italics text be used for water features -- *streams, rivers, lakes, oceans,* etc. -- only.)
3. Text overlaps other text. (Words or numbers are overlapping each other. They need to be repositioned.)
4. Text size is incorrect. (The text size is either too large or too small to be appropriate for the particular feature being indicated.)
5. Add the word "County." (Counties should be designated as such. This tells the reader unambiguously what the name refers to. It also avoids confusion such as: Navajo -- reservation?, county?; or Apache -- county?, reservation?, etc.)
6. Symbol overlap. (Two symbols are overlapping, or touching each other. They should be repositioned.)
7. Symbol not centered on road or number not centered in shield. (The road shield symbol may not be centered properly on the road, or the number inside may not be centered correctly within the shield. More exactness is required in placing these items.)

8. Add symbol to show location. (A symbol would be helpful in indicating the exact location of some features. A good example on this map would be the use of small triangles to show the site of named mountain peaks.)

9. Include road number? (Some road numbers could be omitted in congested areas where routes run on the same road. In that case, just indicate the major road -- for example I-10.)

10. Symbol should be shown in legend. (All symbols shown on the map must be included and identified in the legend.)

11. Boundary lines hard or impossible to follow. (Because of map congestion or lack of color differentiation, lines in these areas cannot be followed.)

12. Omit lines or place explanation in legend. (The purpose of these lines is not indicated on the map. --See especially the Kofa National Wildlife Refuge, etc.)

13. Road ends? (Does the road really end here?)

14. Paved road? (Is this road really paved?)

15. Add road? (Should a road be added here?)

16. Check land status. (Questionable land status. Note: This reviewer did not do a land status check. I recommend that this be done by an appropriate editor.)

17. Spelling error. (Self explanatory.)

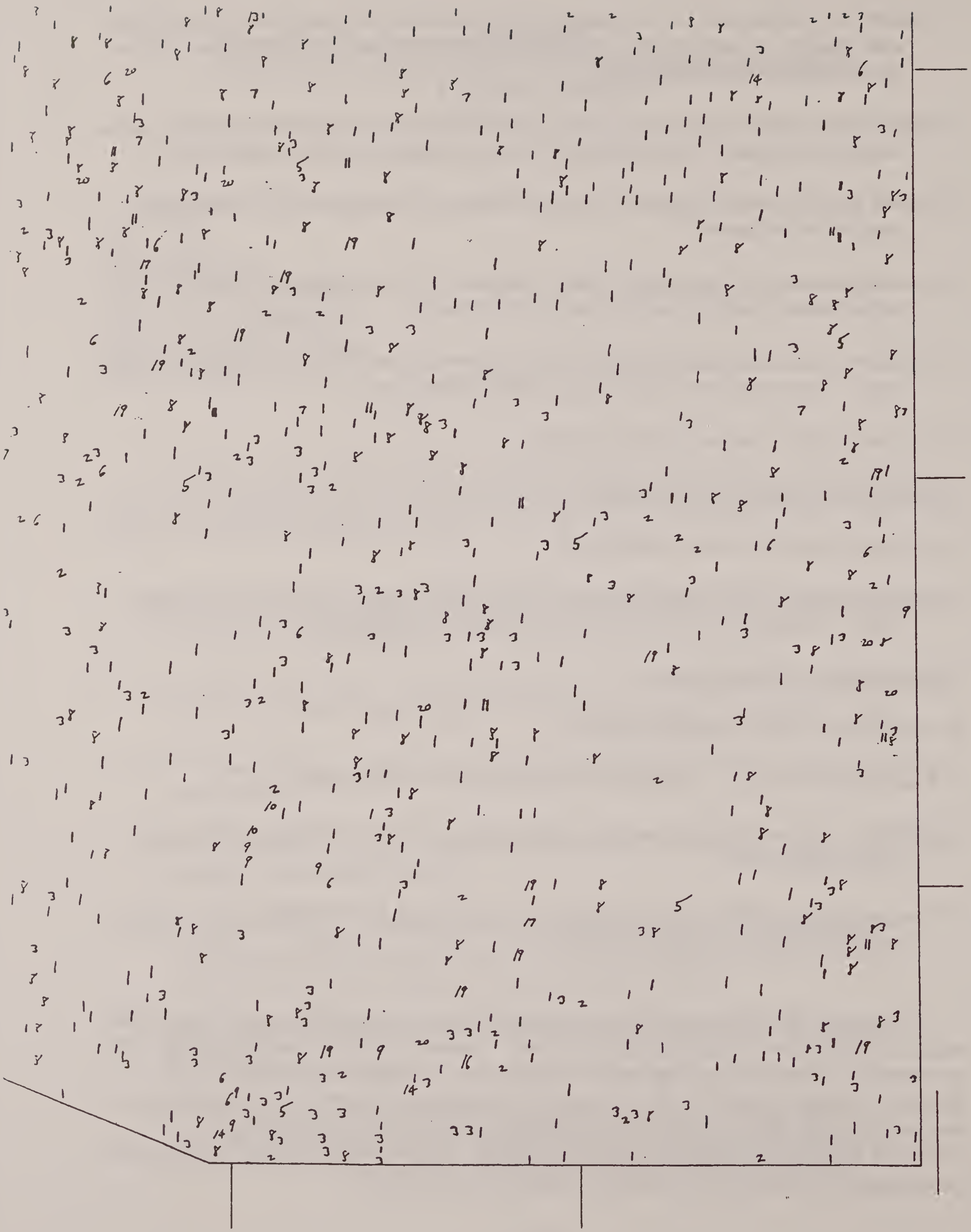
18. Text missing. (Text or numbers missing.)

19. Road symbol missing. (A road symbol should be added where indicated.)

20. Shift text. (The text should be moved to make it more centered, straighten it, place it in a better location, etc.)

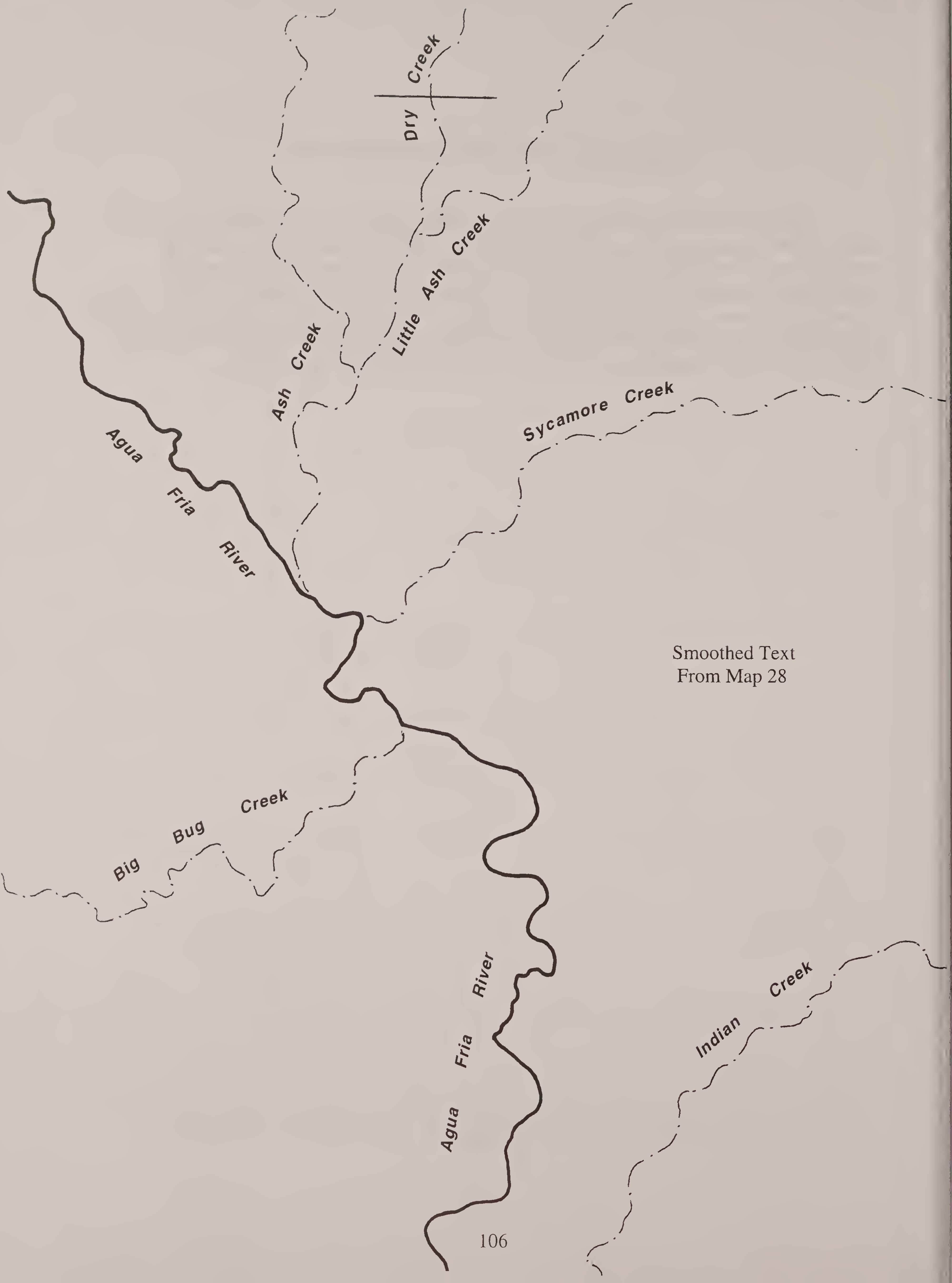
21. Text consistency problem. (Use of text here is not consistent across the map. For example, symbols showing “89A” vs “ALT-89.”)

In general, this map suffers from the attempt to place too much information upon it. The result is a product that is somewhat difficult to read. The text is (in many cases) too small, while the symbols and lines are sometimes hard to see because of crowding and the lack of color contrast. In a future edition I would recommend choosing only the most important data for the main purpose of the map, enlarging the selected text to a *minimum* of 6-point type, and positioning all of the map elements for better readability. If more detail is needed, the map should be redesigned into four separate quads and produced at a larger scale.



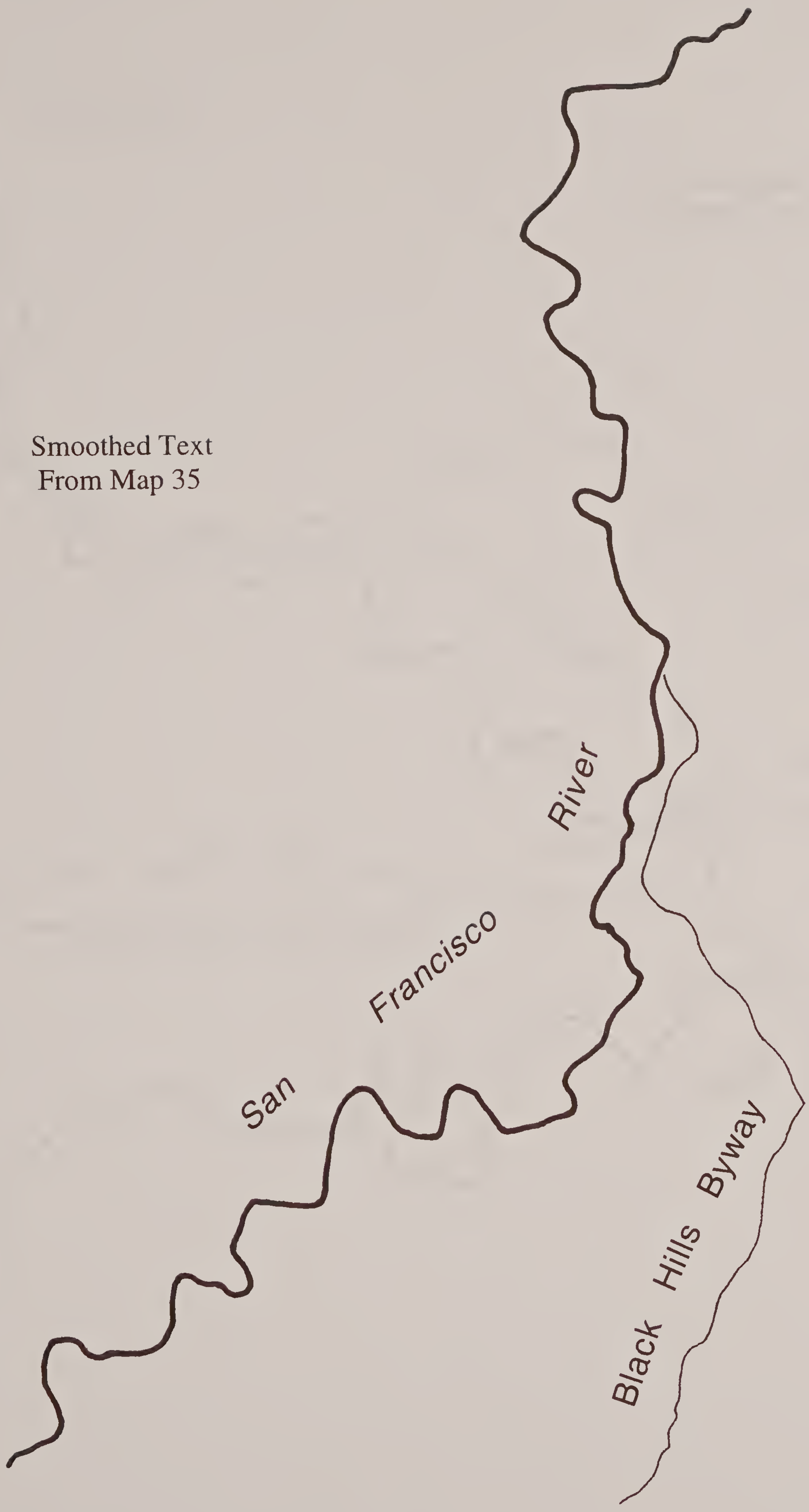
Appendix III: SMOOTHED TEXT EXAMPLES

Appendix III displays examples of the smoothing of lines of text from Maps 28, 35, 36, and 39 (refer to these maps to see their original form). Keep in mind that these examples demonstrate only one modification solution. Many other ways of smoothing are possible (usually small variations of the ones shown). The smoothing of text is a subtle art and is probably better done by eye than exact measurement. What you ultimately want to try to achieve is a geographic feature label that definitely and unambiguously identifies the feature, yet flows gracefully with it, thus producing a result that is balanced and pleasing to the eye.

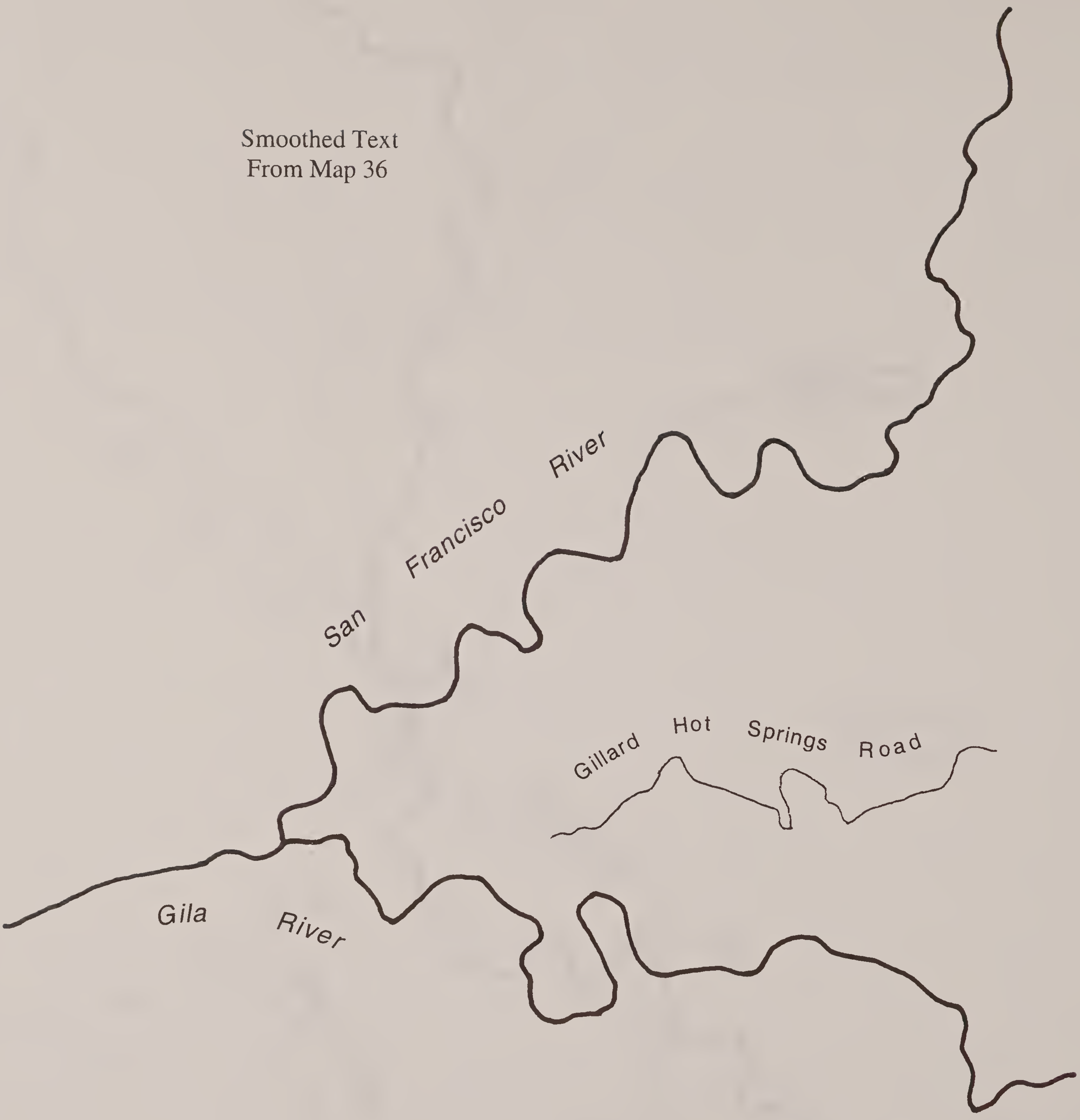

Dry Creek
Little Ash Creek
Ash Creek
Sycamore Creek
Agua Fria River
Big Bug Creek
Agua Fria River
Indian Creek

Smoothed Text
From Map 28

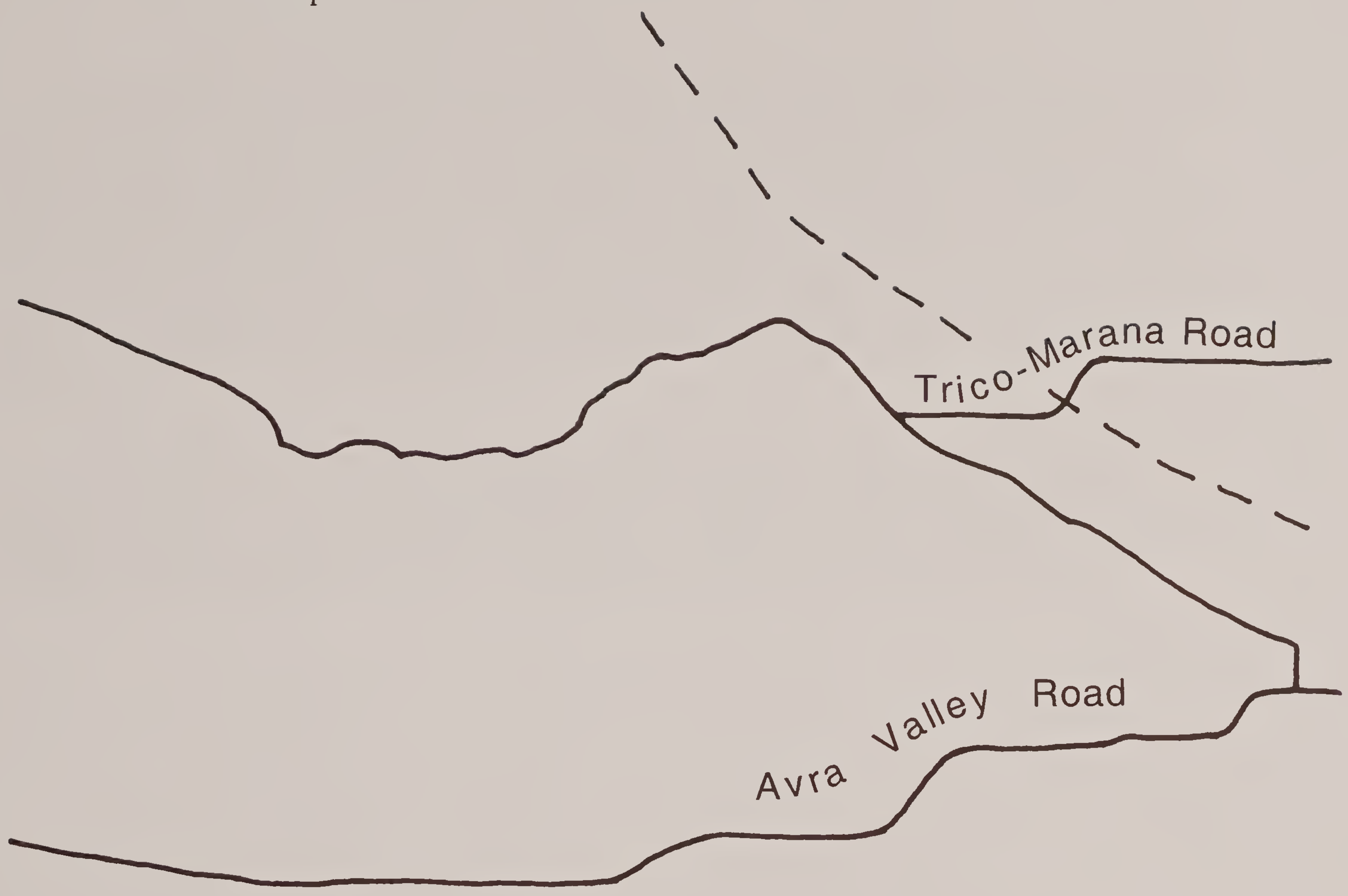
Smoothed Text
From Map 35


River
San Francisco
Black Hills Byway

Smoothed Text
From Map 36


San Francisco River
Gillard Hot Springs Road
Gila River

Smoothed Text
From Map 39


Trico-Marana Road
Avra Valley Road

Appendix IV: TEXT GHOSTING

The technique of text "ghosting" is used in order to make geographical labels *stand out* from the surface upon which they are printed. This enables them to be much more readable and results in a better understanding of the map. Ghosting is nothing more than placing a white expanded image around each letter (and consequently, each word) so there is maximum contrast between the letter and the background. If the original letter is black and its "ghost" is white, the letter will be visible whether it lies upon a black or white surface (or, for that matter, a surface of any tone of grey or color in between). While black text on a white "patch" will have the same effect, it is not nearly as visually pleasing as an outline that "molds" itself to the individual letters.

The two maps on the following pages are shown at their printed sizes; both were originally in color. Figure 1 demonstrates the "patch" technique, while Figure 2 exhibits the "ghosting" technique (note in particular "Pocatello," "Idaho Falls," etc. in Figure 2). I think you will agree that the ghosting version is visually more pleasing in the displaying of text.

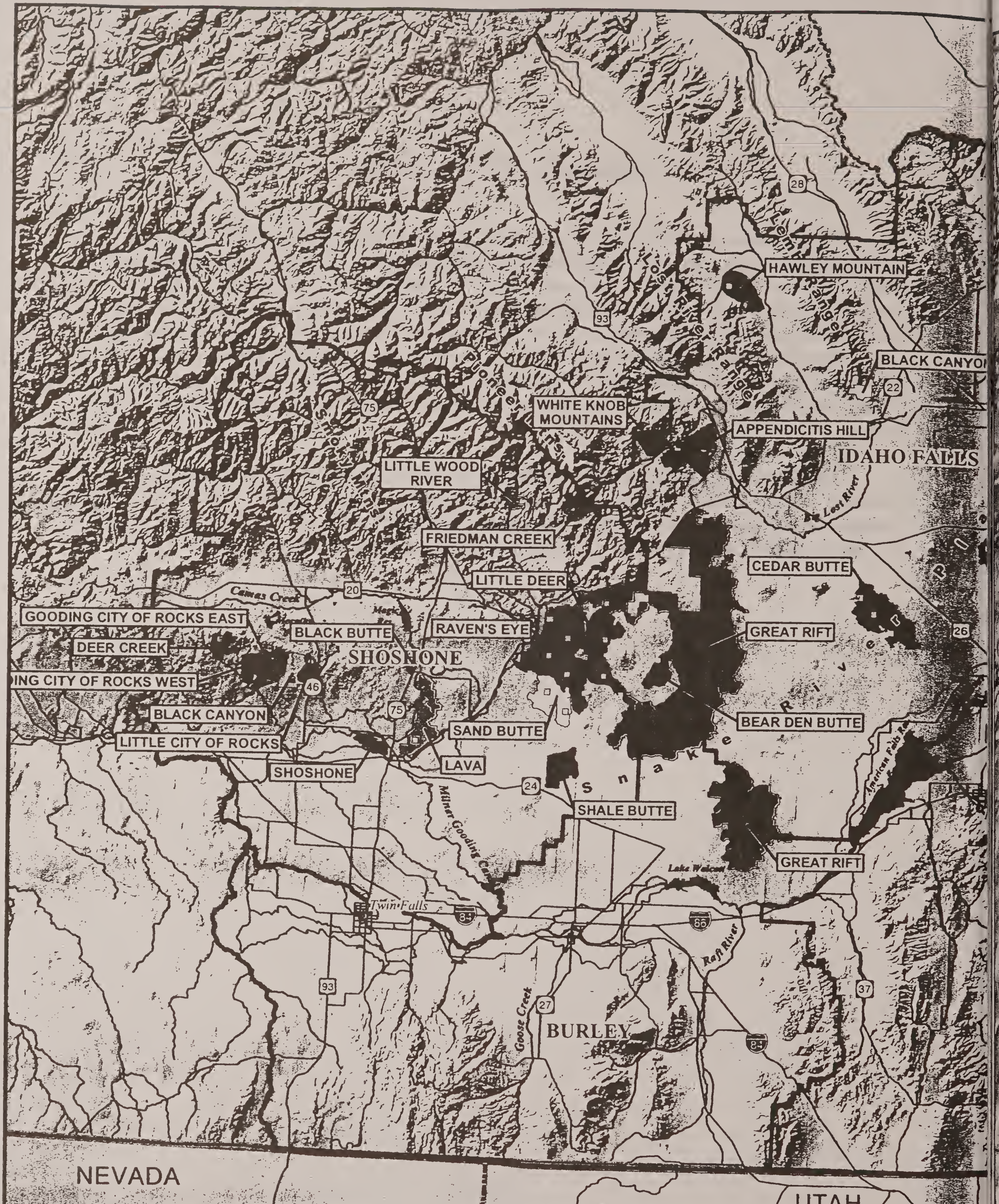

HAWLEY MOUNTAIN
Lemhi Range
Lost River Range
28
93
BLACK CANYO
22
Pioneer Mts.
75
WHITE KNOB MOUNTAINS
APPENDICITIS HILL
IDAHO FALLS
LITTLE WOOD RIVER
Big Lost River
FRIEDMAN CREEK
CEDAR BUTTE
LITTLE DEER
20
Camas Creek
Magic
GOODING CITY OF ROCKS EAST
BLACK BUTTE
RAVEN'S EYE
GREAT RIFT
26
DEER CREEK
SHOSHONE
DING CITY OF ROCKS WEST
46
75
BLACK CANYON
BEAR DEN BUTTE
SAND BUTTE
LITTLE CITY OF ROCKS
LAVA
SHOSHONE
24
Snake River
SHALE BUTTE
American Falls Res.
Milner Gooding Canal
GREAT RIFT
Lake Walcott
Twin Falls
84
86
Raft River
93
Goose Creek
27
37
BURLEY
84
NEVADA
UTAH

Figure 1: "Patch" Technique

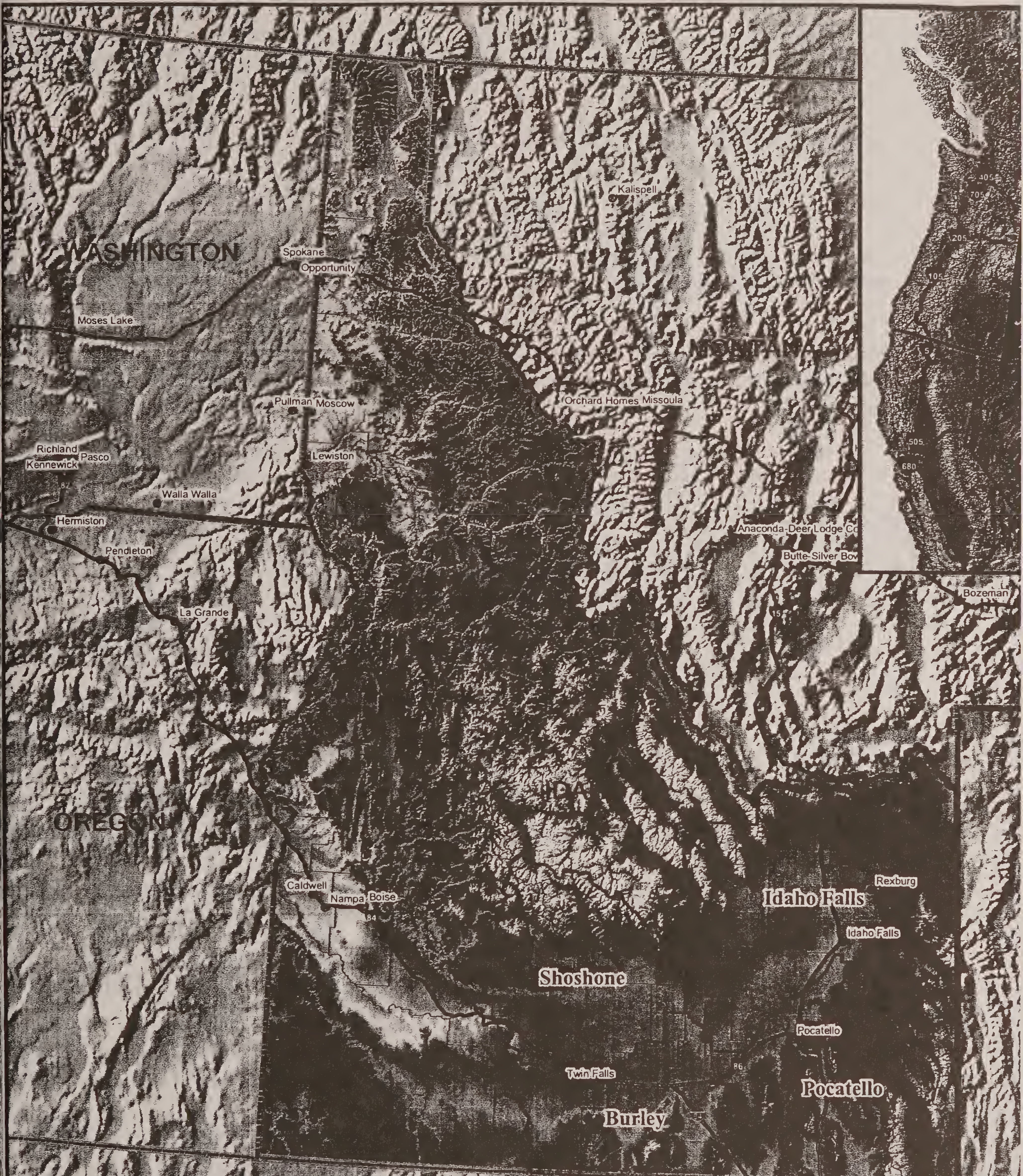

WASHINGTON
Spokane
Opportunity
Moses Lake
Pullman
Moscow
Lewiston
Richland
Pasco
Kennewick
82
Walla Walla
Hermiston
Pendleton
La Grande
OREGON
Kalispell
MONTANA
Orchard Homes
Missoula
Anaconda-Deer Lodge Co
Butte-Silver Bov
Bozeman
15
405
705
205
105
5
505
680
IDA
Caldwell
Nampa
Boise
84
Rexburg
Idaho Falls
Idaho Falls
Shoshone
Pocatello
Twin Falls
86
Pocatello
Burley
NEVADA
UTAH
Logan

Figure 2: "Ghosting" Technique

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Cartographic Check-List: An Aid to Achieving Quality and Completeness in the Creation of Mapping Products by Stephen Meszaros. U.S. Department of the Interior, Bureau of Land Management, Arizona State Office, Phoenix, Arizona: 2003.

Other Cartographic Textbooks and Popular Books
(select the most recent edition available)

Elements of Cartography by Arthur H. Robinson, et al.

Cartography: Thematic Map Design by Borden D. Dent

Cartographic Design and Production by J.S. Keates

Introductory Cartography by John Campbell

Cartography: Visualization of Spatial Data by M.J. Kraak and F.J. Ormeling

Maps and Diagrams by F.J. Monkhouse and H.R. Wilkinson

Mapping by David Greenhood

ABOUT THE AUTHOR

Stephen Meszaros has been involved in the cartographic and graphic field for over 45 years. (He began actively drawing maps in grade school, on everything from note paper, to flattened paper bags, to old window shades!) Steve graduated from Delaware Literary Institute and Franklin Central School, in upstate New York, with School and Regents Diplomas in Science & Mathematics. He also received the school Geography Prize. At Syracuse University he took his Bachelor's Degree in Geography, specializing in cartography and physical geography. This was followed by 4 years in the U.S. Air Force as a Drafting and Cartographic Supervisor for the Aerospace Cartographic and Geodetic Service, based in Kansas. During this time he spent a year in Brazil and 6 months in Vietnam. Following military service Steve completed a Master's Degree in Geography at Arizona State University, concentrating on regional geography and historical & contemporary geographic thought.

Steve's civil service career began with the U.S. Geological Survey at the Center of Astrogeology in Arizona, the Water Resources Division in California, and the Special Mapping Center at USGS Headquarters in Virginia. In these positions he was a scientific illustrator, cartographer, and map editor. This was followed by 10 years with NASA as a visual information specialist for Goddard Space Flight Center in Maryland and the Ames Research Center / Dryden Flight Research Facility in California. During this period of time Steve took a 6 month break in government service to become the Chief of the Public Affairs Office at Kitt Peak National Observatory in Arizona. For the past 16 years he has been a visual information specialist for the Arizona State Office of the Bureau of Land Management.

Steve's maps and visuals are used across the United States. His displays and exhibits have been shown in the U.S. and Europe, and his slide sets are featured world-wide. Most major astronomy textbooks contain his illustrations, as do many popular-level space science books and journals. His work has appeared on television and the World Wide Web (and one of his visuals has even been made into a jigsaw puzzle!)

Steve has been the recipient of many honors throughout his career, including the prestigious NASA Outstanding Service Award. He is the author of over 20 publications for NASA and the astronomical and educational community. Following retirement from the government with over 30 years of service, Steve plans to continue his work as a consultant to NASA and various universities.

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